IMPACT OF PUBLICLY FUNDED RESEARCH ON THE CANADIAN TERRITORIAL ECONOMIES

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ABSTRACT

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In 1998 it was recommended by the Canadian Task Force on Northern Research that action must be taken to monitor, manage, and safeguard the northern environment and respond to emerging social issues in the North. Since these recommendations were made, considerable financial contributions have been made by Canada for its northern and arctic research activities. Although northern research is necessary to monitor changes occurring in Canada's north, northern research has had other 'spillover' effects on local and territorial economies.

This study evaluated the economic contribution of publicly funded research in Canada's territorial economies between 2000 and 2009 using Statistics Canada input-output multipliers. By using these multipliers the economic impacts of research expenditures in the North on output (sales), GDP, income and employment were determined for Nunavut, Yukon and Northwest Territories. Through this research it was determined that territorial publicly funded northern research expenditures has increased substantially causing millions of dollars in economic impacts within the territories. It was estimated that 65% of the impacts occurred between 2007 and 2009.

Although the public research sector has grown considerably, in the context of the entire territorial economies, it was estimated that during 2007 northern research impacted the territorial GDP by only 0.04%, income by 0.09% and employment by 0.11%. Thus viewing the impacts of publicly funded northern research on a territorial level it appears that the economic contribution is minimal.

Although the territories-level benefit is small, more significant impacts may be realized within communities. For example, the money spent locally on lodging, subsistence, the hiring research assistants, paying for translation services, providing compensation for research involvement, and other associated costs may have a substantial effect on those northern comunities where the research activity is conducted, as they otherwise have limited wage earning or revenue generating opportunities.

Overall, this research provides the first economic evaluation of northern research treating

the research expenditures as an economic activity or ‘sector’. Through this research an evaluative framework has also been developed that will enable the northern research institutes to monitor and assess the economic benefits of northern research at the territorial level in the future.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1: INTRODUCTION

In 1998 the Canadian Task Force on Northern Research was formed to assess the state and contribution of Canadian research in the North. The Task Force found that if immediate action was not taken Canada would fail to meet basic national requirements to monitor, manage, and safeguard the northern environment or respond effectively to emerging social issues in the north (Task Force on Northern Research, 2000). Since these recommendations were made, considerable financial investment has been made by Canada for its northern and arctic research activities. The data collected for this thesis show that in 2009 alone over $40 million of public funds were spent on research conducted in Nunavut, Yukon and Northwest Territories.

Although northern research is necessary to help monitor the northern environment and respond to emerging social issues, northern research expenditures have had other impacts on the local economy that to date have gone unmeasured. For example, of the $40 million spent on publicly funded northern research in 2009 large portions were allocated to paying for the local accommodations of researchers, payment for various northern services, and compensation for local expertise and involvement in the research. These expenses then resulted in both direct and indirect spillover effects on the northern territorial economies. Used here 'spillover' represents the unintended, indirect and induced benefits that are generated as northern research funds enter the local and territorial economies. Therefore the purpose of this study was to conduct an analysis of the economic contribution of publicly funded research expenditures in Canada's territorial north between 2000 and 2009 and to identify the direct and indirect impacts on the local economies.

1.1 Purpose and Objectives

Since the release of the Task Force's report there has been considerable investment in northern research. Despite this investment there has yet to be a quantitative measure of the benefits or the economic impact of northern research expenditures on the territorial economies.

Nor has the economic impact of northern research as an economic activity or 'sector' been compared to other northern industries. Publicly funded northern research may be comparable to other northern industries due to some of the publicly funded research expenditures being allocated for local accommodation, services, and local research participation. That is, local factor services are employed in the conduct of the research. It is in this context that the study objectives are: 1) to determine the economic impact of publicly funded research expenditures on Canada's territorial economies; and 2) to compare the value of publicly funded research expenditures to other northern industries. In conducting this research, issues relevant to the territorial economies will be addressed such as how and where public research funds are spent, how this has changed between 2000 and 2009, and the potential impacts on local economies.

1.2 Hypothesis

Based on the above objectives the following null hypothesis will be tested: Northern research expenditures will not have a significant impact on territorial economies. The data are expected to support a rejection of the null hypothesis and acceptance of the alternative hypothesis: Northern research expenditures will have a measureable impact on the territorial economies.

1.3 Organization of Thesis

This thesis is organized into eight chapters. Chapter 2 presents an economic review for each of the three territorial economies. This includes examining the GDP and employment in the northern territorial economies. Also details and outlooks are given for industries with the greatest impact on the northern territorial economies. Chapter 3 offers a background on publicly funded northern research in Canada and a description of the northern research agencies and funding programs that contributed to the results of this thesis. Chapter 4 provides a review of the relevant literature on regional economic assessments and the economic role of research in regional economics. Chapter 5 reviews the economic theory relating to economic impact modelling that informed the analysis. Chapter 6 describes the analytical framework and methodology used to calculate the economic impact assessment. Finally, in Chapter 7 the research results are presented followed by the conclusions and implications presented in Chapter 8.

CHAPTER 2: BACKGROUND

This thesis is focused on the expenditure on publicly funded research in Canada's 3 northern territories, the Yukon, Northwest Territories and Nunavut. This chapter provides a description of the territorial economies of the Yukon, Northwest Territories and Nunavut, as well as an economic review of associated activities.

2.1 The Canadian Territories

The Canadian north includes three territories, the Yukon, Northwest Territories, and Nunavut. The Canadian North is 14,275,633 km^2, making up over 40% of the land mass in Canada. However, it is sparsely populated with less than 1% of the population. Nunavut is the largest of the three territories with a land mass of approximately 2,093,190 km^2, followed by the Northwest Territories (1,171,918 km^2) and the Yukon 482,443 km^2 (Encyclopedia of Canadian Provinces, 2007).

Although Nunavut is the largest territory, in 2010 it was the least populated with only 33,200 people compared to the Northwest Territories with 43,800 and the Yukon with 34,800 (Statistics Canada, 2011). However, the population in each territory is growing, as seen in the most recent National Census Data[1].

In 2010, approximately 75% of the population in the Northwest Territories and Yukon resided in the capital cities of Yellowknife and Whitehorse (Encyclopedia of Canadian Provinces, 2007). In Nunavut only 40% of residents live in the capital city of Iqaluit, with the remaining population distributed among 32 dispersed communities (Nunavut Bureau of Statistics, 2011). In 2006, the non-aboriginal populations in Nunavut, Yukon and Northwest Territories were 15%, 77% and 51% respectively (HRSDC, 2006).

Territorial economies are based largely on exploration and mining of natural resources such as oil, gas and metal ores but also consist of public service, retail, construction, agriculture, energy, arts and crafts, film and sound, fishing, hunting, tourism, and trade sectors. The

[1] Statistics Canada Table 051-0001

territorial economies also largely rely on international trade with a dependence on exports. Traditionally the economy of the Canadian territories consisted largely of arts and crafts, fishing, hunting and trapping industries and although these industries do not contribute significantly to the GDP today they remain deeply embedded in the cultural roots of the Aboriginal and non-Aboriginal peoples and are considered important to their overall wellbeing.

The North is undergoing rapid changes. Some of these changes include Aboriginal political development and the settlement of comprehensive land claims, the growth and expansion of both Aboriginal and non-Aboriginal governments and institutions, population growth, heightened global interest in mineral development, and climate change. These changes affect territorial economies in a number of ways, some positive and other more detrimental. Below is a brief economic review and outlook which contains information on the territorial economies and some of the more important economic sectors that currently operate.

2.2 Canadian Territorial Economic Review and Outlook

Below Table 2.1 shows that the 2007 GDP was $1,739.6 million for the Yukon, $4,456.5 million for the Northwest Territories and $1,293.3 million for Nunavut. However, the GDP in the territories is relatively small representing less than 1% of the total Canadian GDP[2]. Table 2.1 also indicates that the major economic sectors vary between territories. In 2009 mining and oil and gas extraction was quite significant to the Northwest Territorial economy contributing 39.2% to the total GDP while public administration[3] was the major economic sector in the Yukon and Nunavut Territories with 21.6% and 25.5% of the total GDP respectively.

The largest contributor to the Yukon's GDP was public administration. The second largest contributor was the finance, insurance and real estate sectors with 15.9%. The third largest contributor to the Yukon's GDP is construction (11.3%) followed by mining oil and gas extraction (7.9%) tied with health care and social assistance. The largest contributor to the Nunavut's GDP is also public administration followed by construction (17.6%), finance and insurance, real estate etc. (14.8%) and educational services (10%). The largest contributor the Northwest Territories' GDP is mining although construction is second (11.9%). Other major

[2] In 2010, the Canadian GDP was $1,624,608 (Statistics Canada Table 380-0030)

[3] Public administration includes activities in the government sector, consisting of legislation activities, taxation, national defence, public safety, immigration services, foreign affairs and also the administration of government programs

contributors to the Northwest Territories' GDP include public administration (10.8%), finance and insurance, real estate etc. (9.3%), and transportation and warehousing (5.6%).

Table 2.1. 2007 GDP by Industry, current dollars ($ millions)

	YT	NWT	NU
Agriculture, forestry, fishing and hunting	2.7 (0.2%)	27.4 (0.6%)	1.8 (0.1%)
Mining and oil and gas extraction	138.6 (7.9%)	1,745.8 (39.2%)	31.8 (2.5%)
Utilities	27.8 (1.6%)	58.0 (1.3%)	40.7 (3.1%)
Construction	196.6 (11.3%)	530.4 (11.9%)	227.9 (17.6)
Manufacturing	14.0 (0.8%)	15.8 (0.4%)	2.0 (0.2%)
Wholesale trade	43.9 (2.5%)	89.9 (2.0%)	15.3 (1.2%)
Retail trade	96.1 (5.5%)	127.6 (2.7%)	55.7 (4.3%)
Transportation and warehousing	55.4 (3.2%)	251.5 (5.6%)	36.1 (2.8%)
Information and Cultural industries	51.2 (2.9%)	72.9 (1.6%)	41.5 (3.2%)
Finance and insurance, real estate, etc.	276.6 (15.9%)	413.1 (9.3%)	191.1 (14.8%)
Professional, scientific and technical services	42.8 (2.5%)	77.7 (1.7%)	17.9 (1.4%)
Administrative and support, waste management and remediation	21.7 (1.3%)	56.3 (12.6%)	28.9 (2.2%)
Educational services	108.0 (6.2%)	162.0 (3.6%)	129.7 (10.0%)
Health care and social assistance	138.2 (7.9%)	192.3 (4.3%)	99.1 (7.7%)
Arts, entertainment and recreation	9.8 (0.6%)	7.4 (0.2%)	1.9 (0.2%)
Accommodation and food services	63.8 (3.7%)	71.2 (1.6%)	21.5 (1.7%)
Other Services (excluding public admin)	79.1 (4.5%)	76.5 (1.7%)	20.0 (1.5%
Public administration	375.3 (21.6%)	480.7 (10.8%)	330.4 (25.5%)
Total GDP (millions of dollars)	**1,739.6**	**4,456.5**	**1,293.3**

Statistics Canada Table 379-0025: Gross domestic product (GDP) at basic prices, by North American Industry Classification System (NAICS) and province, 2007 current dollars

Table 2.2 shows the total employment by industry for each of the three territories. The data in Table 2.2 was obtained from Statistics Canada Table 281-0024. However, when trying to obtain the employment for some industries such as mining, oil and gas extraction the data was unavailable. Therefore the value for these industries was left blank in Table 2.2. The percentage values for each industry are based on the total known employment.

As shown in Table 2.2 below the total known employment in 2007 was 17,003 in the Yukon, 18,464 in the Northwest Territories and 8,676 in Nunavut. The industry employing the greatest number of people was public administration for all three territories with 33.1% in Yukon, 24.8% in the Northwest Territories and 35.4% in Nunavut.

The second largest employer in the Yukon in 2007 was retail trade with 14.2% of the total known employment, followed by transportation and warehousing with 9.5% which is tied with the accommodation and food services industries. The second largest employer in the Northwest Territories in 2007 was transportation and warehousing (16.7%) of the total known employment, then retail trade (13.1%) followed by the construction industry (10.9%). The second largest employer for Nunavut was educational services (16.9%), followed by retail trade (12.4%) and transportation and warehousing (8.4%) of the total known employment. The percentages obtained for each territory may be skewed as the data on employment for some industries is unavailable.

Table 2.2. 2007 Employment by Industry, all employees

	YT	NWT	NU
Agriculture, forestry, fishing and hunting	x	x	x
Mining and oil and gas extraction	x	x	x
Utilities	x	x	X
Construction	1,007 (5.9%)	2,010 (10.9%)	564 (6.5%)
Manufacturing	x	x	x
Wholesale trade	347	x	x
Retail trade	2,413 (14.2%)	2,423 (13.1%)	1,076 (12.4%)
Transportation and warehousing	1,624 (9.5%)	3,088 (16.7%)	726 (8.4%)
Information and Cultural industries	478 (2.8%)	x	x
Finance and insurance, real estate, etc.	326 (1.9%)	x	x
Professional, scientific and technical services	569 (3.3%)	837 (4.5%)	215 (2.5%)
Administrative and support, waste management and remediation	286 (1.7%)	953 (5.2%)	319 (3.7%)
Educational services	1,300 (7.6%)	1,591 (8.6%)	1,470 (16.9%)
Health care and social assistance	955 (5.6%)	769 (4.2%)	474 (5.5%)
Arts, entertainment and recreation	x	x	x
Accommodation and food services	1,610 (9.5%)	1,436 (7.4%)	372 (4.3%)
Other Services (excluding public admin)	468 (2.2%)	777 (4.2%)	391 (4.5%)
Public administration	5,620 (33.1%)	4,580 (24.8%)	3,069 (35.4%)
Total known number of employees	**17,003**	**18,464**	**8,676**

Statistics Canada Table 281-0024: Employment (SEPH), unadjusted for seasonal variation, by type of employee for selected industries classified using the North American Industry Classification (NAICS), annual (persons)
x Suppressed to meet the confidentiality requirements of the *Statistics Act*

Not shown in Table 2.2 but still relevant is the fact that in the Yukon one of the main employers is tourism and in 1996 it was estimated that tourism created 1,200 jobs (Barber-Dueck and Kotsovos, 2003)[4] compared to the Northwest Territories and Nunavut in which tourism only created 1,100 jobs in total. The employment numbers for mining are not provided by Statistics Canada and thus are not reported in Table 2.2, however, it was found that in 2010 the major

[4] The information is out of date due to the number of jobs created by tourism being complicated to calculate. All tourism numbers obtained from The Provincial and Territorial Tourism Satellite accounts for Canada, 1996

employer in the Northwest Territories was the mining sector which created over 2,500 direct jobs and provided employees with the highest salaries and wages in Canada (NWT Industry, Tourism and Investment, 2011a). In Nunavut in 2010 the government was still the largest employer and employing approximately 2400 people (Conference Board of Canada, 2010) .

In May 2011 the unemployment rate in the Yukon was 7.4%[5] tying the national unemployment rate[6]. The Northwest Territories unemployment also hovered around the national rate with 8.2% but was significantly lower than in Nunavut where unemployment reached 16.1% although decreasing 1.1% from May 2010.

Important industries in terms of GDP and employment are different for each Territory. For example, in the Yukon tourism is very important in terms of employment and in the Northwest Territories the mining sector is one of the most important in terms on GDP and employment. However both Table 2.1 and 2.2 shows that public administration is one of the most important to the northern economy as a whole. This is because in 2007 the industry of public administration contributed greatly to the GDP and as shown in Table 2.2 was the largest single employer in all three territories. Public administration includes federal, provincial, local and Aboriginal government industries.

Table 2.1 shows the contribution to GDP, in millions of dollars and Table 2.2 shows the total employment, by all industries relevant to the Canadian territories in 2007. However, details and outlooks are provided in the next section only for the industries with the greatest impact on the northern territorial economies today. These are mining, construction, tourism, arts, fishing, hunting, trapping and public administration

2.2.1 Yukon

This section shows economic contribution of mining, construction, tourism, arts, fishing, hunting and trapping and public administration industries to the Yukon's economy. According to Table 2.1, in 2007 mining contributed 7.9% to the Yukon GDP; construction, 11.3%; arts, 0.6%; and fishing, hunting trapping with 0.2% of the Yukon GDP. Although the tourism sector in 1996 had the greatest impact on the economy with 46.7% of the territorial GDP, current figures could not be found. Tourism includes transportation, accommodation, food and beverage

[5] All unemployment statistics were obtained from Statistics Canada, CANSIM, table 282-0100
[6] Statistics Canada, CANSIM, table 282-0087

services as well as recreation, entertainment and travel agencies (Barber-Dueck and Kotsovos, 2003).

Mining in the Yukon is mainly gold mining but has large undeveloped deposits of other minerals such as iron, zinc-lead, nickel, and copper. The zinc-lead deposit in the Yukon is the largest undeveloped zinc-lead deposit discovered in the world and the iron deposit is the 2nd largest of its kind in the world (Yukon Economic Development, 2011). These large deposits have attracted local and international investors and thus the mining industry has a very positive outlook for the future. Currently 90 companies are undertaking active exploration projects in the Yukon (Yukon Economic Development, 2011). The oil and gas sector in the Yukon is largely undeveloped but two pipeline construction projects are in development stages (Government of Yukon, 2010). Direct employment numbers for the mining, oil and gas sector could not be found as they are unavailable from Statistics Canada. However a reported record number of people were working in the Yukon due to an increase in jobs created by a boom in mineral exploration activities (CBC News, 2011).

In the Yukon many new construction projects were started 2009 but carried over to 2010 and 2011 and are now nearing completion. In late 2010, construction started on residential buildings in Whitehorse which will be available in 2011. Plans for new building projects in 2011 include new hospital facilities in Watson Lake and Dawson city, and an ambulance dispatch station and an airport hangar in Whitehorse (Yukon Economic Development, 2011). Many utility projects are also continuing into 2011 including road and utility upgrades. However, the contribution to GDP by the construction sector is predicted to decrease as many projects are scheduled to finish in 2011 (Yukon Economic Development, 2011). According to Table 2.2, in 2007 approximately 1,007 people were employed in the construction industry.

In the Yukon the tourism sector consists of 6 tourist information centres. In 2010 the Yukon had 311,542 visitors which is an increase of 10.1% from 2009. More visitors from the US and other countries were reported but lower visitation was recorded for tourists from other parts of Canada (Yukon Economic Development, 2011).

The Arts industry in the Yukon consists of film production, video production, sound recording, and visual arts and crafts. The Yukon is known for its beauty and not only attracts tourists but also people from the film and sound industry. The Yukon has been the setting for many film productions due to the large amount of daylight hours and snow for much of the year.

Also the Yukon's sound recording industry consists of award winning artists (Government of Yukon, 2010). Statistics Canada does not provide estimates on employment for the Arts industry. However it was found that in 2006 the Yukon's music industry consisted of 292 artists and service providers (Kisquared, 2006). Also in 2009 the Yukon Film and Sound Incentive Program approved $876,193.95 in funding for 35 projects (Yukon Economic Development Film & Sound Commission, 2010).

Although many people in the Yukon hunt, fish and trap on a subsistence and commercial basis, statistics Canada does not provide data on these forms of employment (Government of Yukon, 2010).

In 2011, the Yukon GDP is projected to increase between 3 to 4%, the population is expected to grow 2.1% and unemployment rate is expected decrease to 6.5% due to investments in the mineral, oil and gas sectors as well as increasing tourism (Yukon Economic Development, 2011).

2.2.2 Northwest Territories

This section shows economic contribution of mining, construction, tourism, arts, fishing, hunting and trapping and public administration industries to the Northwest Territories' economy. Table 2.1 shows that the mining, oil and gas extraction industries have the greatest impact on the Northwest Territories economy. In fact, this industry in 2007 contributed 39.2% to the GDP. Also Table 2.1 shows that in 2007 construction contributed 11.9% to the Northwest Territories' GDP; arts, 0.2%; and fishing, hunting trapping with 0.6% of the Northwest Territories' GDP. In 2010 tourism represented 2% of the GDP (NWT Industry, Tourism and Investment, 2011b) and the tourism industry is expected to grow 2.8% over the next five years (NWT Industry, Tourism and Investment, 2011a).

The Northwest Territories has extensive diamond mining operations and is one of the most important sectors to the economy with 29% of the GDP. The Northwest Territories has three diamond mines and one tungsten mine operating currently. Diamond mining is the largest industry in the Northwest Territories contributing $900 million to the GDP in 2009. However due to the economic crisis sales and employment have declined in recent years but production levels are returning to levels existing prior to the recession. Not only is mining the largest economic sector it is the main employer. The mining industry has the highest wages and salaries

in Canada and in 2009 employed 2,500 people (NWT Industry, Tourism and Investment, 2011). It also generates income in transportation, services, trade and construction sectors.

In the Northwest Territories natural gas sales have been down due to weak prices, declining facilities, declines in exploration and field development. However, oil prices reached record breaking prices in 2008 and sales rose in the Northwest Territories to $620 million. Although prices have since fell they are rebounding and the outlook remains positive (NWT Industry, Tourism and Investment, 2011).

In the Northwest Territories the construction industry is small. Firms typically have less than 20 employees and revenues of less than $250,000. Although this industry is small it has potential for growth as some construction firms in the past have expanded business into the southern provinces. In 2009, the construction industry in the Northwest Territories employed 1,937 people, consisted of 7.2% of the workforce and 9% of the private sector. The construction sector grew between 2001 and 2009 but the growth is closely related to construction of diamond mines (NWT Industry, Tourism and Investment, 2011).

According to the Government of the Northwest Territories Industry, Tourism and Investment website, in 2010-11 over 69,830 tourists visited the Northwest Territories. In 2010 tourism represented 2% of the GDP and has remained stable over the past ten years although suffering recently due to the economic crisis and the H1N1 virus (NWT Industry, Tourism and Investment, 2011b). Since 1999 the Northwest Territories has seen an increase in Japanese tourists but the industry has had limited success attracting European visitors. Canadian and US tourist number have remained stable although increasing recently due to regular flights being available now from Edmonton to Yellowknife. The tourism industry is projected to grow 2.8% over the next five years depending on the economy (NWT Industry, Tourism and Investment, 2011a). Specific employment in the tourism sector is not available for the Northwest Territories specifically but according to the Statistics Canada, approximately 1,100 people were employed in the tourism sector for both the Northwest Territories and Nunavut.

Although not a huge contributor to GDP the Arts industry is very important to the residents of the Northwest Territories, especially those in smaller remote communities. The Arts industry includes arts and crafts and film. In a 2010 household survey conducted by the Northwest Territories Bureau of Statistics, 68% of residents produced some sort of arts and craft, of these people 924 sold them for profit with 27% reporting an income of $1,000 or more a year. On the

other hand the film industry in 2010 contributed more than $750,000 to the NWT economy (NWT Industry, Tourism and Investment, 2011a). The film industry produced two television series, two commercials, and multiple documentaries including the creation of a video for Vancouver Olympics.

Freshwater fishing in the Northwest Territories is done commercially, as well as for subsistence, and sport. The commercial fishing industry has suffered recently with production declining by 78% since 2000/2001 season due to depleting fish stocks. This negatively impacts locals who rely on fish as a food source and tourism associated with the sport fishery. The trapping industry provides food, material and cash income and is still an important part of the Northwest Territories economy. Although the value of the fur harvest has declined in recent years it provides a reliable and consistent income for many people in remote communities (NWT Industry, Tourism and Investment, 2011a).

Table 2.1 shows that public administration was the second largest contributor to the Northwest Territories' economy in 2007 contributing 10.8% to the GDP. However, educational services and health care and social assistance also had a significant impact on the Northwest Territories' economy, contributing approximately 7.9% to the GDP. According to Table 2.2 public administration employed 4,580 people, educational services employed 1,591 people and health care and social assistance employed 769 people. According to the Northwest Territories' Minister of Finance's fiscal and economic update statement of August 17, 2011, in 2009/10 and 2010/11 the NWT government invested $1.1 billion in roads, bridges, schools, health centres, housing and other critical infrastructure.

2.2.3 Nunavut

This section describes the economic contribution of mining, construction, tourism, arts, fishing, hunting and trapping and public administration industries to Nunavut's economy. Table 2.1 shows that the public administration industry has the greatest impact on the Nunavut economy. In 2007 public administration contributed 25.5% to the GDP. The construction industry has the second largest impact on the economy and in 2007 construction contributed 17.6% to Nunavut's GDP. Table 2.1 also shows that arts contributed 0.2%; and fishing, hunting trapping 0.1% of Nunavut's GDP. The GDP impact of tourism was not available, although is

reportedly insignificant (Nunavut Department of Economic Development and Transportation, 2008).

Mining contributed to Nunavut's GDP in 2010 less than 1% because only one gold mine is in operation. Right now the mine is undergoing construction and employs 1,435 people (3% of the population) but this number will decrease once construction is completed. Although there are no guarantees, two new gold mines are likely to come into production in 2011 and a uranium mine is in development stages (Nunavut Economic Forum, 2010). In 2009 no mining operations were in existence (Conference Board of Canada, 2010). There is no oil and gas sector in Nunavut although there is potential for development (Nunavut Economic Forum, 2010). Oil and gas reserves in Nunavut are estimated to contain 11% of Canada's total crude oil and 20% of Canada's natural gas resources (Frampton, 2009).

Due to five large projects, the construction industry in 2010 was one of the largest contributors to GDP in Nunavut (16.4%) (Nunavut Economic Forum, 2010). However, this is expected to fall in 2011 as most projects were scheduled to be completed by 2011. In the long-term the additional mining operations should increase the portion of GDP attributable to mine construction and operation. Approximately 21.7% of the population of Nunavut is employed by the construction industry (Nunavut Economic Forum, 2010).

Nunavut has many attractions for tourists such as arctic landscapes, wildlife, unique culture, history, and arts. However, the industry has yet to become economically significant although the government has implemented a new strategy to attract tourists. The strategy involves targeting tourists in niche markets, at conferences, and from cruise ships to increase visitors. In 2008, 13,889 non-residents were reported to visit Nunavut (Nunavut Department of Economic Development and Transportation, 2008). As mentioned previously employment in the tourism sector could not be found for Nunavut specifically but according to Statistics Canada, approximately 1,100 people were employed in the tourism sector for both the Northwest Territories and Nunavut.

The arts and cultural industries are also very important to the everyday lives of the Nunavut people. A 2010 study conducted by the Nunavut department of economic development and transportation showed the portion of GDP making up of the arts and cultural industries was $22.9 (Nunavut Economic Forum, 2010). The study also estimates 2,500 to 3,500 people were employed in the arts sector. The arts sector is composed of not only traditional arts and crafts

such as soap stone carving, Inuit crafts, print making, storytelling, and music but also by the film and television industry. The film and television industry is estimated to contribution over $12 million dollars to the Nunavut economy in 2010 (Nunavut Economic Forum, 2010).

The commercial fishing industry in Nunavut contributes a small portion to the total GDP. Four organizations hold 100% of Nunavut's fish quota and fish turbot and northern shrimp. Projected increased investments in the inshore fisheries may allow the turbot quotas to increase as well as new markets created for clams and scallops (Nunavut Economic Forum, 2010). Unfortunately employment statistics for this industry are unavailable.

Table 2-1 shows government contribution had the largest influence on Nunavut's economy. Government contributions include public administration and non-commercial services, such as social services, education and health care (Conference Board of Canada, 2010). Table 2.1 shows that public administration contributed 25.5% to the GDP, educational services contributed 10.0% and health care and social assistance contributed 7.7%. Table 2.2 shows that public administration employed 3,069 people, educational services employed 1,470 people and health care and social assistance 474. In Nunavut the government sector is predicted to grow as it has done over the past ten years but growth will likely be in the education and health sectors mainly (Nunavut Economic Forum, 2010). In 2010 the government of Nunavut has close to 1000 vacant positions needing to be filled (Nunavut Economic Forum, 2010).

2.3 Challenges and Opportunities for Canadian Territorial Economies

One challenge faced by all three territorial economies is the high cost of living due to higher retail prices than other areas of Canada due to the large shipping costs. Also the growth of the northern economy is mainly dependent on commodity prices[7] which can be highly unstable due to economic uncertainty. The main concern for each territory is that they lack necessary infrastructure for example roads, utilities and telecommunication towers they will be enable the development of natural resource sectors, support a larger population, and ensure more residents have access to internet and phone services (Nunavut Economic Forum, 2010). Positive aspects for the territorial economies includes population growth, an expansion in the labour market, continued investment in the mining sector and increasing growth in tourism, all due to global economy rebounding.

[7] Higher commodity prices drive investments in mining operations, creating jobs and stimulating the local economy

The 2011 Northwest Territories Economic Review and Outlook shows that in the long term the outlook for the Northwest Territories is positive due to the large amounts of natural resources available for development. Plans are in development for the natural gas fields in the Mackenzie delta and GDP is predicted to increase to $7.9 billion when the project begins. Seven new mining projects are also expected to start in the next ten years which could add 2,000 more jobs. However, due to the multiple mining operations the main challenge facing the Northwest Territories economy include enforcing regulations and reviewing the environmental practices of mining operations while still encouraging mining and exploration projects (NWT Industry, Tourism and Investment, 2011a).

According to the 2010 Nunavut Economic Outlook, the GDP increased in 2010 for Nunavut due to the global economy recovering, causing increasing investments in mining operations. In fact in the next 5 to 10 years Nunavut GDP is expected to increase dramatically due to the development of mining operations.

2.4 Chapter Summary

Economically significant industries in each of the three territories include mining, oil and gas extraction; public administration; construction; finance; educational services; and health care and social assistance services. However, as climate change, related environmental concerns, and sovereignty over northern resources gain national and international importance, publically funded research may become an important growth industry. The next chapter provides an overview of northern research in Canada.

CHAPTER 3: NORTHERN RESEARCH IN CANADA

This Chapter provides an overview of northern research in Canada followed by a description of relevant public research agencies that support northern research. While not inclusive of all programs, either nationally or internationally, the programs described here represent some of the most significant funding programs in Canada.

3.1 An Overview of Northern Research in Canada

In 1998, the Canadian Task Force on Northern Research recommended that the Tri-Council and other federal research programs rejuvenate funding support for northern research and develop new funding mechanisms that would "augment existing research expertise, train a new generation of northern researcher, increase the amount of high quality research being done in the north, and enhance the involvement of northern communities in research" (Task Force on Northern Research, 2000).

Since these recommendations were made, considerable financial contributions have been made by Canada for its northern and arctic research activities. In 2009 publicly funded organizations and programs contributed over $40 million to support northern research. These include, the Tri-Council composed of Natural Sciences and Engineering Research Council of Canada (NSERC) Northern Research Chairs, Social Sciences and Humanities Research Council (SSHRC) Northern Research Development Grants and annual Strategic Research Grants, and Canadian Institute of Health Research (CIHR) Institute for Aboriginal Peoples Health; Northern Contaminants Programs; Northern Ecosystems Initiative; Arctic-Net Network Centres of Excellence; Polar Continental Shelf Programme; and the Northern Students Training Program. Also, Environment Canada, Transport Canada, the Department of National Defense, Industry Canada and the Department of Fisheries and Oceans (DFO) sustain active northern research programs. Funding provided by the Federal Government also includes $150 million over 6 years for Canadian involvement in the International Polar Year (IPY) (2006-2011) (IPY, 2007).

3.2 Publicly Funded Northern Research Agencies and Programs in Canada

There are many publicly funded research agencies and programs conducting northern research in Canada. However, this section only describes the northern research agencies and programs that contributed to obtaining the results in this study. These are the Tri-Council, ArcticNet, Northern Contaminants Program, Northern Ecosystem Initiative, Sustainable Communities Initiative, International Polar Year, Northern Student Training Program, Polar Continental Shelf Project, and Arctic Infrastructure.

The Tri-Council is made up of three granting agencies. The Natural Sciences and Engineering Research Council of Canada (NSERC), the Social Sciences and Humanities Research Council (SSHRC) and the Canadian Institute of Health Research (CIHR).

NSERC was established in 1978 and is funded by the federal government to enhance the science and technology capabilities in Canada (NSERC, 2009). This type of research was previously funded by the National Research Council. SSHRC was created in 1997 and is funded by the federal government to enhance the understanding of social, cultural, technological, environmental, and economic and wellness issues (SSHRC, 2011). CIHR was created in 2000 and is funded by the federal government to not only create new health knowledge but also to apply it in a real world setting (CIHR, 2011).

The ArcticNet program was incorporated in 2004 and is a Network Centres of Excellence designed not only to study the impacts of climate change in the coastal Canadian Arctic but also bring together human health and social science researchers, Inuit organizations, northern communities, government agencies, and the private sector. The Canadian ArcticNet research program is composed of 145 researchers who work in partnership with other researchers in Denmark, Finland, France, Greenland, Japan, Norway, Poland, Russia, Spain, Sweden, UK, and USA (ArcticNet, 2011).

Canada's Ministry of Aboriginal Affairs and Northern Development (AANDC) administers the Northern Contaminants Program (NCP). Established in 1991, the NCP evaluates contaminants in the wildlife commonly consumed by northern Aboriginal residents.

Environment Canada established the Northern Ecosystem Initiative (NEI) in 1998 to enhance and sustain the ecosystem northern communities depend on for food and sustainability. Thus maintaining and improving the northern ecosystem will benefit the future health and

sustainability of the communities themselves. NEI research is conducted in partnership with Aboriginal communities and organizations, including Inuit Tapiriit, Kanatami, Dene Nation, Council of Yukon First Nation and Innu Nation (Environment Canada, 2008).

The Sustainable Communities Initiative (SCI) is a partnership between Natural Resources Canada (NRCan), and other federal agencies including AANDC, Environment, Agriculture and Agri-Food, provincial governments, private sector and voluntary organizations. The SCI helps rural, coastal, Aboriginal and northern communities learn how to use and implement Geographic Information Systems (GIS) so that they can make decisions regarding their economic, environmental and social development. A maximum of $30,000 was budgeted to be spent on GIS equipment, data, training and a confidence building project in approximately 100 small communities all over Canada (NRCan, 2005).

The International Polar Year (IPY) in 2007-2008 was the largest international scientific research program to focus on the Arctic and Antarctic regions. Research and observations were done over a 24-month period. IPY involved the participation of tens of thousands of researchers and scientist from over 60 countries, including Canada. It is estimated that 60% of the projects involving the research of northern polar components will include Canadian involvement (IPY, 2007). The Government of Canada allocated funding of $150 million to the program which will stretch over a 6 year period (IPY, 2007).

The Northern Scientific Training Program (NSTP) is sponsored by AANDC and was created in 1961 to meet the growing need for northern research specialists. The program was designed to help offset the higher cost of conducting research in the north. NSTP supports research from all disciplines and multi-disciplinary fields of science (Turner, 2010). According to the NSTP annual reports[8] between 2000 and 2006[9] NSTP provided support to universities in the amount of approximately $4.5 million dollars.

The Polar Continental Shelf Program has been funding northern researchers for over 50 years. PCSP is designed to support and offer expert advice to the Canadian government, universities and private institutions as well as non-Canadian researchers working in areas through the Canadian Arctic. The program provides support for transportation, communications, accommodation, field equipment and related services. Every year PCSP provides funding and

[8] http://www.aadnc-aandc.gc.ca/eng/1100100037337
[9] Data only publicly available for 2000 to 2006

services to over 130 scientific groups from over 40 universities and government agencies (NRCan, 2010).

In 2009, the Canadian Government announced funding to invest in the upkeep and maintenance of key existing Arctic research facilities. The objective of the Arctic Research Infrastructure Fund is not only to improve existing facilities but also ensure the facilities are safe, energy efficient and continue to meet the needs of researchers (AANDC, 2009). In 2009 the Government of Canada dedicated over $85 million towards this initiative (AANDC, 2011a).

3.3 Ethical Principles for Northern Research

Principles for the ethical conduct of research in the north were first created by the Association of Canadian Universities of Northern Studies (ACUNS) in 1982. These principles have been the most widely cited and adopted principles among Canadian northern researchers. However since the first publication many changes have occurred. Many northern land claims have been settled, research contexts shifted, and sometimes communities felt disregarded by researchers. Therefore the principles were updated in 2003 to encourage cooperation and mutual respect among researchers and northern residents.

Although most local residents support northern research, some have major concerns for how research is conducted. Communities also expect to be compensated for the contributions they make to the conduct of such research. In 2007, a guide was published by the Association of Inuit Tapiriit Kanatami (ITK) and Nunavut Research Institute (NRI) that identifies 12 concerns of local residents:

- Local people often feel that scientists do not make enough efforts to consider local Inuit knowledge in framing research questions and designing studies. Inuit often believe some research is unnecessary as the local people already have the answers on the topic.
- Some locals also feel that they could be more involved in local research such as project design, data collection and analysis and communication of results.
- Although research proposals budget for the inclusion of local expertise the knowledge is not always used
- Local participants in research are not always appropriately compensated for their time nor receive credit in publications.

- Local knowledge is inappropriately combined or generalized to form a generic picture when local knowledge is distinct to the region.
- Local knowledge and expertise is sometimes presented as the researchers.
- Some locals also perceive data collection methods as biased or even detrimental to population being studied.
- The short field season of one or two months is not a sufficient amount of time to complete a study or to completely understand what is going on in the environment being studied.
- Communities often complain that they do not receive any tangible benefits from research
- Funding agencies obtain funds from government institutions making funding hard to obtain for community-initiated projects.
- Information gathered by research studies is often contained in databases not accessible to northern communities
- The most frequent criticism by local residents is that scientists do not let locals know when results are obtained and are frequently surprised to find out projects are completed without their knowledge.

(ITK and NRI, 2007)

Since the release of this report it has now become more or less common if not expected practice to engage communities more directly in the research process. This is reflected in where funds are used to cover costs associated with pre-project consultation with community members; provision of local employment and training opportunities; pay honoraria for local experts; use of local accommodations and services; and funds for results reporting including translation, interpretation, transcription, and in person visits (Gearheard and Shirley, 2007)

3.4 Chapter Summary

The territories are experiencing rapid changes due to climate change, a growing population, the growth of both Aboriginal and non-Aboriginal governments and institutions, increased tourism and an increased interest in mining of natural resources. Due to these rapid changes a corresponding growth in northern research has occurred during this same time. It is

this context that this research has set out to measure that growth and quantify the economic contribution of publicly funded research to the territorial economies. The following chapter reviews the relevant literature that informed this analysis.

CHAPTER 4: LITERATURE REVIEW

This chapter reviews the relevant literature that informed this research. The first part of this chapter explains that the economic impacts of research are most commonly examined through technology and productivity improvements. However, this thesis examines the economic impacts of research from a perspective that research causes multiplier effects within the local economy. Therefore the chapter concludes by examining studies which use government supplied input-output tables to examine multiplier effects.

4.1 The Role of Research in Regional Economics

According to Salter and Martin (2001), investigating the multiplier effects from government spending on university and industry research and development research is the foremost technique to describe the benefits of publicly funded research. The existence of these multiplier effects enhances the productivity of an industry by expanding the available industry knowledge (Salter and Martin, 2001). A multiplier effect is when an initial direct impact occurs in an industry, such as an increase in sales, thus causing a series of indirect and induced economic impacts. For example, the direct impact occurs in the industry that experienced the increase in sales. Indirect impacts occur due to the inter-industries transactions necessary to satisfy the increase in sales. The induced impact measures the changes in household income due to the direct and indirect impacts.

There are two main forms of multiplier effects, geographic and across sectors/industries. Geographic multiplier effects suggest that firms benefit when located near research centres, other firms and universities. Salter and Martin (2001) conduct a critical review of literature on the economic benefits of publicly funded basic research. They found that the econometric literature on localisation effects and multiplier effects of publicly funded research emphasized the need by advanced industrial countries to develop basic research capabilities so that they can use the knowledge generated by others. Basic research capabilities are also necessary in advanced

industrial countries so that technological development can be sustained. Salter and Martin (2001) also found that personal connections and mobility are vital to integrating basic research into technology development. Personal contacts and interacting face-to-face is essential for the research process as well as for sharing and transfer of knowledge quickly and effectively. Policies designed to support geographical agglomeration should help facilitate this interaction (Wolfe, 1996).

Salter and Martin (2001) also found that multiplier effects are common among research related activities. Griliches (1995) similarly found that the level of productivity achieved by one firm or industry was dependent not only on its own research efforts but also on the general pool of knowledge accessible to it. Salter and Martin (2001) also find that work by economists on new growth theory view multiplier effects as the main mechanism underlying growth patterns. The models suggest that encouraging these types of effects through government institutions may be successful from a policy perspective (Romer, 1990).

Martin et al. (1996) and Salter and Martin (2001) state that publicly funded research contributes to economic growth by:

1. Increasing the stock of useful knowledge;
2. Training skilled graduates;
3. Creating new scientific instrumentation and methodologies;
4. Forming networks and stimulating social interaction;
5. Increasing the capacity for scientific and technological problem-solving;
6. Creating new firms

Salter and Martin (2001) conclude that the drawback of the models used to examine the multiplier effects of publicly funded research and industrial research and development are that they rely heavily on the theoretical embellishment of production functions and make limited use of empirical data. They do show knowledge and technology spilling over across sectors and fields but it is difficult to develop measures to accurately describe the extent of the effects. Also, most models focus on industrial research and development rather than publicly funded basic research.

This thesis views the economic impacts of research in a different way than the models examined by Salter and Martin (2001). The impacts of research are not examined through technology and productivity improvements but rather research causes impacts by increasing

employment, GDP, income and output in the local economy. The approach used to evaluate the impact of research on the Canadian northern economy views the expenditures made by researchers on specific items and services (i.e. travel and accommodation) as a change in the final demand for those sectors. This change in final demand in the local sectors is viewed as an increase in output in those sectors which causes other impacts such as an increase in employment, GDP and income.

4.2 Other Relevant Studies

This section provides a review of literature where the authors have used either Canadian or American government developed input-output tables to conduct regional input-output analyses. The data contained within the government developed input-output tables are used to conduct research on a variety of topics such as diversification options, technology trends, and assessing the impacts of including and removing entire industries from the regional economy.

Diversification options within the Saskatchewan economy was evaluated by Gilchrist and St. Louis (1991, 1994, 2001) using data from the 1979 and 1984 Provincial Saskatchewan input-output tables. These authors have conducted multiple studies together in which they construct models relating to diversification within the Saskatchewan economy. They have looked particularly at finding a direction for diversification within the Saskatchewan economy as a whole (1991) as well as finding an equilibrium for industrial (1994) and agricultural (2001) diversification within Saskatchewan. Gilchrist and St. Louis (1991, 1994, 2001) model the region based on the assumption that commodity prices or technological shocks are unknown.

Technology trends in the Canadian government sector are examined by Murty (2004) using annual Canadian input-output data. The study used input data of government spending on production activities from 1961 to 2000. The government sector was then divided into four categories: health services; education service, defence services and public administration services. The data revealed that the shares of public administration and education had no noticeable changes during the time period examined. However, significant trends were observed in the health and defence services. Health services showed an upward trend increasing 9% between 1961 and 2000. Defence services was the opposite showing a downward trend of 9% over the time period examined. Government production technologies in the Canadian economy were found to be influenced not only by the changing patterns in defence and health services, but

also by the changing input patterns. The changing input patterns caused a decline in wages and salaries and an increase in purchased services such as contracting out for professional and other business services. Murty (2004) did not measure the productivity or efficiency of the government producing sector but was a fact finding study only.

Removing an entire industry from a regional economy and assessing the impacts was done by Stabler and St. Louis (1988). During the 1950s a number of initiatives were taken by the provincial government of Saskatchewan to both stimulate and diversify the economy. In this study Stabler and St. Louis (1988) conduct a post-project impact assessment on one of the initiatives which was the creation of a steel rolling mill and fabricating plant. In this study they used the 1979 Saskatchewan input-output table created by Statistics Canada as a base model. Stabler and St. Louis (1988) then removed the steel industry from the Saskatchewan economy and reduced final demand and primary inputs from the appropriate categories such as household expenditures and wages and salaries. Stabler and St. Louis (1988) assume the output from the steel industry is still necessary in the economy but is now imported. They compare the multiplier results from the original Saskatchewan input-output model to the one they created in order to show the direct, indirect and induced effects of the steel industry on the local economy. Direct and indirect linkages were found to extend to every major sector of the provincial economy. It was also found that the total increase in employment and economic activity supported by the steel rolling mill and fabricating plant is greater than what would probably be shown if a less comprehensive method was used to conduct the analysis.

Adding an entire industry to a regional economy was done by Thomassin et al. (1992). In this study they show the macroeconomic impacts of creating ethanol plants in Quebec and western Canada that process Jerusalem artichoke, an agricultural feedstock. The input-output model was a modified version of the 1984 Statistics Canada National input-output table. The impact of the ethanol plant was calculated by adding the ethanol sector as a final demand vector. Final demand is included for the construction of the plant and is estimated as the inputs necessary for construction. Final demand is also altered to include final demand for the crop itself and is estimated as the cost of production. Once the new input-output table is constructed the direct, indirect and induced effects are estimated. It was found that ethanol produced from Jerusalem artichoke tops could be economically feasible. In fact, the development of this

industry could have sizeable macroeconomic effects and provide additional benefits with respect to the environment, the agriculture sector, and energy security.

(Miller, 1984) estimated not only the increase in output for manufacturing industries who received grants from the Department of Regional Economic Expansion (DREE) but also the increase in employment. The main objective of this study was to find the employment impacts on the manufacturing industries due to the grants. The program aimed at increasing manufacturing job opportunities in the Atlantic Provinces. They used manufacturing shipments and transportation of raw materials as inter-industry interprovincial trade flows. When estimating interprovincial flows of services, service commodities were categorized as either local or national services. In order to find out how much the granting program impacted the final demand for manufacturing services the total payments to each manufacturing industry was broken down into capital and labour payments. Those payments are then further divided by their corresponding income-output ratios. The labour income-output ratios were calculated by dividing the employment estimates for each industry by the industry output obtained from the 1974 Atlantic provincial input-output table. The employment estimates by industry were obtained by surveys and a census. It was found that the indirect and induced employment effects were quite large. In fact the indirect and induced employment effects were 75% of the direct employment effects. Although Miller (1984) does state that due to the lack of information on 1) the substitution and crowding out effects of the grants, and 2) the precise nature of the industry production functions, it cannot be known with certainty that the DREE grants actually significantly increased employment in the Atlantic Provinces

Goldstein (1989) applies input-output analysis to estimate the regional economic impact of universities and higher education institutions. In this research Goldstein (1989) not only offered an explanation but also a case study describing the input-output method used to find the economic impact of the Chapel Hill's sponsored research budget at The University of North Carolina. First data were obtained from the university's Office of Contracts and Grants. Included was the total amount received during 1983, the amount spent from all grants and contracts specified into about 150 different expenditures categories, the source of each contract or grant (in-state or out) and the location of the each vendor (in-state or out). Once the expenditures were arranged into the different categories the direct out-of-state expenditures were subtracted because they led to no direct or indirect economic activity within the state. The direct

in-state expenditures were then translated into the Standard Industry Classifications codes and then converted into a regional input-output modeling system (RIMS II) input-output industry codes using a conversion dictionary. The RIMS II multipliers were then applied to each of the direct in-state expenditure estimates giving the total direct and indirect impacts on the state economy for each industry (induced impacts were not found). Finally the industry impacts are added together to obtain the total estimated impact of the universities sponsored research activities on the state's economy. Estimates of the income impact were derived from the same regional input-output model.

Goldstein (1989) concludes by discussing the limitations of estimating the economic impacts of universities using input-output analysis. First, due to the large amount of information that must be collected there tends to be a long time-lag between data collection and when the models are available for use. Second, the results from economic impact analysis are often understood as though the economic impact would not have happened because a particular activity, project or institution was absent, when in fact the funds may be spent on an alternative activity, project or institution and these funds may cause an economic impact that is not measured. Third, the economic impacts of higher education institutes are more than can be accounted for in the input-output analysis. An example is the spin-off activities by university or faculty transfer which are not accounted for in the input-output analysis unless sold. These types of activities may lead to increased productivity in some of the region's industries. Since these types of activities are hard to measure Goldstein (1989) states that in the meantime, input-output analysis can be accurately used to measure particular types of economic impacts, but there is a tendency for the model to underestimate the true impacts.

4.3 Chapter Summary

In this thesis the impacts of research are not examined through technology and productivity improvements like examined by Salter and Martin (2001) but rather research and development is viewed as a new sector in the economy and an increase in research expenditures causes impacts in other sectors in the economy. The northern territories are becoming more important due to economic and sovereignty reasons, and given the environmental and social concerns, there may be long-term increases in northern research and development.

Section 4.2 provides a review of literature where the authors have used either Canadian or U.S. government developed input-output tables to conduct regional input-output analyses. The data contained within the government developed input-output tables are used to conduct research on a variety of topics such as diversification options, technology trends, and assessing the impacts of including and removing entire industries from the regional economy. Although none of the studies examined added a new sector in the final demand category the approach used by Goldstein (1989) was found to be the most relevant to this thesis. Goldstein (1989) used input-output analysis to look at the impacts of the final demand for a university's product. Specifically Goldstein (1989) broke down the in-state university expenditures into input-output industry codes and then multiplied the expenditures by the corresponding industry-specific multipliers to come up with the total aggregate output and earnings impacts. The goal of this thesis is to identify similar impacts to Canada's territorial economies.

CHAPTER 5: THEORETICAL FRAMEWORK

The external effects of northern research may be measured within an economic impact assessment framework. This means that the external effects have an impact on the regional economy. By measuring the economic impacts of northern research activities the economic impact on the regional economy may be calculated. This chapter explains the theoretical framework developed to determine economic impacts on a regional economy.

5.1 Measuring the Economy's Performance

National income accounting measures the overall performance of the economy. Statistics Canada compiles the national income accounts for the Canadian economy. National income accounts allow for the health of the economy to be assessed by comparing levels of production at regular intervals. The long-run course of the economy can be tracked to see whether it has grown, been constant or declined. Also policies can be formulated that are aimed at maintaining and improving the economy's health (McConnell et al., 2005).

The main measurement of the economy's performance is its aggregate output, defined as the economy's annual total output of goods and services. Aggregate output is also known as the gross domestic product (GDP). GDP is a monetary measure of the output of a nation and allows for the comparison of relative values of numerous goods and services produced in different years. GDP includes only the market value of final goods and ignores intermediate goods altogether. Intermediate goods and services are purchased for resale while final goods and services are purchased for final use by the purchaser. Intermediate goods are not included in GDP because the value of them is already included in the value of the final good. Multiple counting would occur if intermediate goods were included in GDP and the value of GDP would be distorted (McConnell et al., 2005).

There are two ways of calculating GDP, including expenditure and income approaches. The expenditure approach views the GDP as the sum of all money spent in buying final goods and services. The income approach views GDP in terms of the income created from producing final goods and services. On the expenditure side of GDP, all final goods produced are bought either by households, businesses, government or buyers elsewhere. On the income side the money made from the sale of the final goods go to the suppliers as income to pay wages, rent, and interest or keep for profit.

The expenditure approach determines GDP by adding up all the spending on final goods and services throughout the year. Consumption expenditures by households (C), investments in machinery, equipment, construction and changes in inventories (I), as well as government spending (G) and net exports (X) are all used in calculating the spending on final goods and services. Adding these categories together provides a measure of the market value of total output in a given year, or GDP.

$$GDP = C + I + G + X$$

The income approach is made up of wages, salaries, and supplementary labour income; profits of corporations and government enterprises before taxes; interest and investment income; net income from farms and unincorporated businesses. When these are all added up the domestic income at factor cost is obtained. This is all the income earned by Canadian-supplied factors of production such as wages, interest, rent and profit.

5.1.1 Aggregate Expenditures Model

The basic principle of the aggregate expenditure model is that the amount of goods and services produced depends directly on the level of aggregate expenditures (i.e. total spending) (McConnell et al., 2005). Aggregate expenditures are the GDP obtained by the expenditure approach mentioned in the previous section. The key assumptions of this model are constant prices and a perfectly elastic supply curve. A perfectly elastic supply curve means that firms can sell any amount of output at the given level of prices.

The aggregate expenditure model relevant to this study is based on an open economy in which aggregate expenditures (AE) are equal to the total goods demanded in the economy. The

total goods demanded in the economy is equal to the sum of consumption expenditures (C), investment expenditures (I), government expenditures (G) and net exports (X). Net exports are equal to exports minus imports.

Consumption expenditure (C) is one of the main components of aggregate demand. Income is the main determinate of consumption expenditures. Consumption expenditures and income are positively related. The consumption function consists of a constant *a*, plus a portion of disposable income Y_d. Where *a* is the consumption when income level is zero and the portion of disposable income is the product of Y_d and the marginal propensity to consume, *b*. The marginal propensity to consume represents the consumption change due to a change in income (McConnell et al., 2005).

$$C = a + bY_d$$

When looking at the relationship between income and consumption the relationship between income and savings is also investigated. Personal saving is defined as the part of the disposable income not consumed. Therefore savings equals disposable income Y_d minus consumption (C). The marginal propensity to save represents the change in savings due to a change in income.

In the aggregate expenditures model, investment expenditures (I) and net exports (X) are assumed to be constant and independent of income. Government expenditures (G) are also assumed constant and independent of income and GDP. The actual output level (Y) is equal to C + I + G + X. However, aggregate expenditures may not be equal to the actual output level all the time. Therefore the equilibrium output is the point at which total desired aggregate expenditures are equal to the actual level of output. Equilibrium output is also the output level at which the quantity of output produced is equal to the quantity demanded.

Figure 5.1 below shows the equilibrium level of aggregate expenditures. The aggregate expenditure function is used to determine the equilibrium level of income and output. The equilibrium level of income (Y*) is equal to the point at which aggregate expenditures (AE) are equal to output. This is also the point where output equals income. The 45° line is a reference line in which all points of aggregate expenditures are equal to the level of output (McConnell et al., 2005). At each point on the 45° line, consumption equals disposable income. The point

where the 45° line and the AE line cross is the equilibrium point, the corresponding income level is the equilibrium income (Y*).

At output levels below the equilibrium point, aggregate demand exceeds output and thus firms will increase their production which will result in an increased income level. On the other hand when output levels rise above the equilibrium point firms have higher levels of inventories and will decrease production.

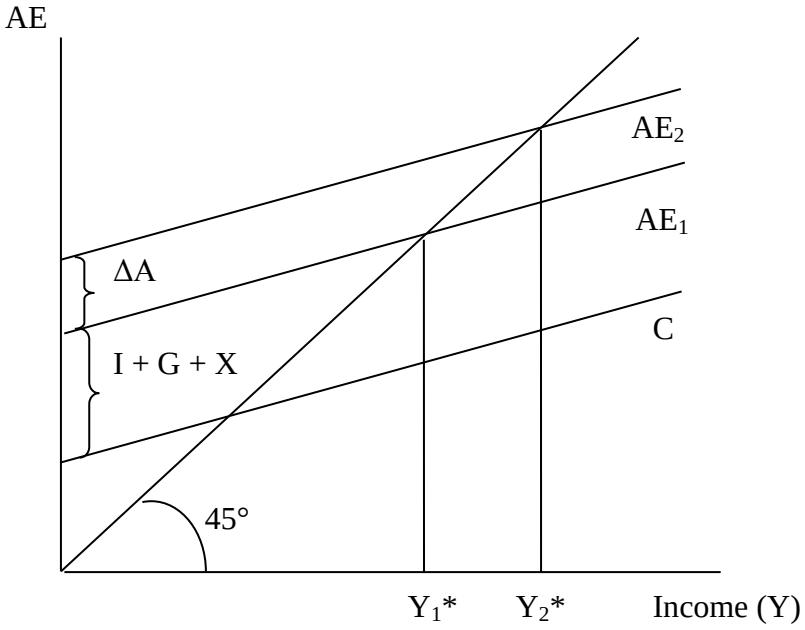

Figure 5.1: Equilibrium Level of Aggregate Expenditures

The equilibrium point will shift up if the level of autonomous expenditures increase and will shift down if autonomous expenditures decrease. Autonomous expenditures are the expenditures assumed to be constant (i.e. investment (I), government (G) and export-import (X) expenditures). For example if the government (G) decided to increase expenditures for research this would cause AE line to shift up because autonomous expenditures have increased. Thus the equilibrium point will also increase causing an increase in the equilibrium income. A multiplier refers to the rate at which the equilibrium income changes for a unit change in autonomous expenditures denoted by ΔA.

The greater the change in autonomous expenditure, the greater the change in equilibrium income will be due to the application of the multiplier. The larger the marginal propensity to

consume, the larger the multiplier value will be. The larger the marginal propensity is to save, the smaller the multiplier value.

Also the size of imports to exports also determined the multiplier value. Net exports (exports minus imports) affect aggregate expenditures in an open economy. Exports create local production, income and employment because foreign countries spend money on the local (exporting) country's products. Imports reduce consumption and investment expenditures by the amount spent on imported goods. This means that exports increase and imports decrease aggregate spending on domestic output. Therefore, the larger the amount of exports the larger the multiplier value while the opposite is true for imports as the larger the imports the smaller the multiplier value will be.

Whether the industry is labour intensive or capital intensive also affects the multiplier. Labour intensive production means that more of the value of output is paid to labour as a factor of production. When local labour is used more goods and services will be demanded within the local economy and the output multiplier will then increase. Capital intensive production will have more of a value of the output flowing to the owners of capital since owners are less likely to be local.

The multiplier is also affected if the local marginal propensity to consume (MPC) is large. If the local MPC is large a greater share of income will be spent locally and all else constant that will increase the size of the multiplier.

5.2 Concept of Input-Output Economics

There is a close relationship between the aggregate expenditure model and the input output model. In fact, they both produce identical current price estimates of GDP. The only difference is that the aggregate expenditure model views all industries as a single homogenous aggregate and input-output acknowledges the existence of multiple industries in an economy.

Input-Output analysis is basically a detailed accounting of inter-industry relationships. The idea of accounting for these transactions was originally created in 1758 by Francois Quesenay (Miller and Blair, 1985). Quesenay published graphically and numerically the sales and purchases by various industries within an economy. More than a century later Quesenay's work was advanced by Leon Walras (Miller and Blair, 1985). Walras provided a concise theoretical formula for an economic system that included consumer purchases and an economic

representation of technology. He used notions from the field of Newtonian mechanics to develop a theory of general equilibrium (Miller and Blair, 1985).

In 1936 Wassily Leontief developed an analytical framework based on the work of Quesenay and Walras that he named input-output analysis. In 1973 Leontief received the Nobel Prize in Economics for not only developing the input-output analysis but also for applying it to important economic problems. That is why today input-output analysis is sometimes referred to as the Leontief model. Input-output analysis is also known as inter-industry analysis. This term came about because the purpose behind the input-output analysis is to "analyze the interdependence of industries in an economy" (Miller and Blair, 1985).

Leontief simplified Walras's theoretical formulation by assuming technology and trading patterns were fixed over time. This assumption allowed economist to use data from a single time period thereby reducing data requirements. Governments from around the world recognized the importance of Leontief's work and as mentioned previously the Canadian government has been publishing input-output tables since 1961 with the most recent being 2007.

Although input-output models are basically an accounting framework the idea behind the model is that the output of one industry requires inputs from other industries, thus all industries are interconnected. Ultimately the input-output model is designed to show the flow of money through the economic system. Thus, when production changes the input-output model specifically shows the resulting inter-industry transactions of all sectors in the economy including households, government and private entities.

Advances in technology, specifically high speed computers, have allowed input-output models to become more convenient, as constructing these models involves creating or manipulating large data tables. The basic form input-output model is a system of linear equations. Each equation represents the distribution of products needed to produce output for an industry in a single economy (Miller and Blair, 1985).

5.2.1 Conventional Input-Output Model

Table 5.1 below is a simple input-output transaction table. The input-output transaction table shows the activities of industries in the region that not only produce output but also consume each other's inputs in order to produce that output. The shaded portion of Table 5-1 is known as the inter-industry transaction matrix. In this portion of the table, the rows represent the

distribution of an industries output while the columns represent the distribution of an industries inputs necessary for the production of its own output.

Table 5.1: Simple Input-Output Transaction Table

From \ To		Purchasing Sectors		Final Demand Sectors				**Total Gross Output**
		Manuf.	Const.	C	I	G	E	
Producing Sectors	Manufacturing	150	500	50	75	100	125	1000
	Construction	300	700	225	200	275	300	2000
Value-Added	Wages and salaries	250	450	120	200	150	250	1420
	Rent	300	350	50	100	125	100	1025
Total Gross Outlay		1000	2000	445	575	650	775	5445

The figures in the shaded portion of the table are the monetary values of sales and purchases of physical goods within and between each producing sector in the region. The final demand sectors represent a final market. The final demand columns represent consumer (C), investment (I), government (G) and export (E) expenditures. The value added rows at the bottom of the table represent payments by producing sectors for wages and salaries and other value added items such as imports. The industries in the supply sector are considered necessary for the production of an industry's good but are not a physical component of the good itself.

The fundamental concept of input-output analysis is that goods flow from one industry to the next (Miller and Blair, 1985). Each industry within the shaded portion of the transaction Table 5.1 (inter-industry transaction matrix) has its own equation representing their sales to each of the producing sectors plus sales to the final demand sector (Miller and Blair, 1985). This is shown below in matrix 5.1.

$$
\begin{aligned}
X_1 &= Z_{11} + Z_{12} + \ldots + Z_{1n} + Y_1 \\
X_2 &= Z_{21} + Z_{22} + \ldots + Z_{2n} + Y_2 \\
&\vdots \\
X_n &= Z_{n1} + Z_{n2} + \ldots + Z_{nn} + Y_n
\end{aligned}
\qquad (5.1)
$$

In Table 5.1 the columns show the amount each industry needs to spend on inputs from other producing sectors and the rows show the amount each industry needs to spend on outputs from other producing sectors to produce their good.

The second step needed to conduct an input-output analysis is to calculate the direct requirements table. Each cell in the direct requirements table is called a technical coefficient (Miller and Blair, 1985). Each technical coefficient represents how many cents must be spent on other producing industry's goods in order to produce one dollar worth of output. The technical coefficients for the direct requirements table (A_{ij}) are calculated by dividing the inter-industry transaction matrix (Z_{ij}) by the total output (X_i).

$$A_{ij} = Z_{ij}X_i^{-1}$$

X_i^{-1} is a *square* matrix and rearranging the above equation

$$Z_{ij} = A_{ij}X_i$$

Where X is a square matrix with the elements of the vector x on the diagonal and zeros elsewhere, Thus,

$$x = (A_jX)i + Y$$

Solving for x yields,

$$x = (I-A)^{-1}Y$$

The Leontief Inverse is the matrix $(I-A)^{-1}$ and is called the total requirements table (matrix). It portrays the relationships between final demand and production. This relationship describes the economic impacts an external event has on the economy being examined (Miller and Blair, 1985).

5.2.2 Input-output Example

A small numerical example is now presented in order to provide a better understanding of the concept of input output analysis and how it works. The first step after constructing the input-

output transaction table is finding technical coefficients. Technical coefficients are the portion of the total inputs of a sector that are required to be purchased from another sector in order to produce an output. The technical coefficients are found by dividing each flow in a particular column of the producing sectors in Table 5.1 by the total output of the sector represented by that column (Miller and Blair, 1985). Thus the technical coefficient for the manufacturing industry (first column and first row of Table 5.1) is equal to 150/1000 = 0.15. In the first column, second row of Table 5.1 the technical coefficient is equal to 300/1000 = .30. In the second column first row the technical coefficient is equal to 500/2000 = .25. In the second column second row the technical coefficient is equal to 700/2000 = .35. This is shown in Table 5.2.

Table 5.2: Input-Output Technical Coefficients for hypothetical example

	Manuf.	Const.
Manuf.	.15	.25
Const.	.30	.35

It is assumed that the technical coefficients represent the structure of production in the economy. The columns are the production recipes for each of the sectors, in terms of inputs from all the sectors (Miller and Blair, 1985). For example, to produce $1 worth in the construction industry one would need 25 cents from the manufacturing industry and 35 cents from the construction industry itself. Once the technical coefficient is obtained it is assumed unchanging.

Now it is possible to find out what happens when the industries experience a change in final demand. For example if government final demand expenditures increase to $300 for the manufacturing sector and decrease to $200 for the construction sector it is possible to find out how much total output from the two sectors is necessary to satisfy the new demand. Initially the manufacturing sector needs to produce $300 and the construction sector needs to produce $200 in order to meet the new final demands. However, to produce $300 the manufacturing sector needs (0.15)($300) = $45 from itself and (.30)($300) = $90 from the construction sector. Likewise, for construction to produce $200 it needs (.25)($200) = $50 from the manufacturing industry and (.35)($200) = $70 from itself. These figures are obtained from the coefficients in column 1 in Table 5.2. This means that in order to produce the original $600 and $1500 in final demand, the manufacturing sector must not only produce $300 but also another $45+$70 = $115

in order to satisfy the needs for additional inputs from itself and the construction sector; the construction sector will also need to produce an additional \$90+\$50 = \$110 to satisfy its own need and that of the manufacturing sector.

It must be noted at the extra production of \$115 and \$110 will also generate inter-industry needs. This means that in order to produce the extra \$115, the manufacturing sector will need (0.15)(\$115) = \$17.25 from itself and (.30)(\$115) = \$34.50 from the construction sector. Likewise in order to produce the extra \$110, the construction sector will need (.25)(\$110) = \$27.50 from the manufacturing industry and (.35)(\$110) = \$38.50 from itself. The total new demands for the manufacturing and construction sectors are \$17.25 + \$27.50 = \$44.75 and \$34.50 + 38.50 = \$73.00 respectively. The \$44.75 and \$73.00 are treated in the same manner as the \$115 and \$110 above and therefore they too will generate additional required outputs. This continues until the numbers become so small they can be ignored (Miller and Blair, 1985).

5.2.3 Input-output multipliers

The total impact of a final demand change is described as the multiplier effect. A multiplier is a way of measuring the impact on an economy after an industry experiences either an increase or decrease in production due to an event (Miller and Blair, 1985). Three different multiplier effects exist. These are direct, indirect and induced. Direct multiplier effects are the changes to the economy that are directly related to the change in sales (i.e. the \$115 and \$110 initially generated to meet the change in final demand). The indirect multiplier effect is one where the impacts on the economy are the change in supplier purchases due to the supplying more or less because of the change in sales (i.e. the \$44.75 and \$73.00 plus the continuation of additional outputs until numbers become so small they are ignored). The induced multiplier effect measures the changes in household income due to the direct and indirect effects.

Multipliers generated by input-output tables can be applied to many different types of economic impacts because they relate not only to the relationship between producing industries and final demand categories but also the changes each experience due to a change in production (Miller and Blair, 1985).

The three most frequently used multipliers are those that estimate the effects of an exogenous change on the outputs of a sector in an economy, the income earned by households

because of new outputs and employment that is expected due to the new outputs (Miller and Blair, 1985).

5.2.4 Input-Output Assumptions and Limitations

Input-output analysis assumes that the technical coefficients are a set of technological parameters in linear production functions with fixed proportions among the various inputs. Assuming the technical coefficients are fixed implies that each industry produces a single homogenous product. The assumption of fixed technical coefficients is justified by declaring that what appears to be a substitution are actually the results of a different combination of homogenous activities, each of which has fixed input coefficients (Bezdek, 1984).

Input-output analysis also assumes inter-industry transaction coefficients are a constant physical relationship between inputs and outputs. This means that the only changes in the inter-industry coefficients are those that result from changes in relative prices and that the constant prices are stable. Due to the assumption that inter-industry transaction coefficients are constant means that when prices change the quantity demanded changes by exactly the same proportion so that the inter-industry coefficients remain constant (Bezdek, 1984).

Due to the huge amount of information that needs to be collected in order to estimate output and earnings multipliers there is usually a long time lag between when the data is collected and when the input-output models are available for use (Goldstein, 1989). This means that the input-output multipliers used in the analysis are usually out of date.

Another issue is that input-output models work with data that is aggregated into economic sectors rather than individual products. For this reason, the results of an input-output show the impact of an industry or product group (i.e. construction) but not of a specific product type (i.e. houses) or even individual products (i.e. condos).

A problem with regional input-output models is that most regional models are derived from national input-output models rather than surveys of businesses in the region, causing inaccuracies in regional input-output models. Although major improvements have been made in the accuracy of these models, there are still errors in the procedures of adjusting the national input-output the national input-output tables to regional industrial composition (Goldstein, 1989).

Another problem with input-output models is that they can only estimate effects based on demand not supply. The input-output model also tends to underestimate impacts because not all

the impacts are measureable. For example, Goldstein (1989) mentions that the economic impacts of higher education institutions extend beyond the types that can be accounted for by input-output analysis. Such as the spin-off activity by university faculty that may lead to increased productivity in some of the region's businesses. Unfortunately these types of impacts are difficult to measure.

Another limitation when conducting an impact assessment using input-output analysis is that there is no way to account for crowding out or substitution. Crowding out may occur when an increase in demand for one sectors product causes resources to be redirected to create that product instead of a product from another sector. Substitution occurs when new demand, such as government demand replaces private demand that would have occurred otherwise. Input-output analysis cannot measure the movement from one activity to another and therefore the net effect of final demand spending cannot be measured.

5.3 Conclusions

According to the economic theory explained above new government spending in the form of publicly funded northern research expenditures will cause two types of impacts on the output of producing industries, GDP, income and employment in the region. The first impact occurs from the locally purchased direct expenditures and the second impact is the result of the multiplier effect and is typically smaller.

Using input-output analysis to examine these impacts is appropriate because it allows for publicly funded research expenditures to be viewed as a new economic sector. The northern economy is of more interest to the government in recent years because of economic and sovereignty reasons, also the northern economy faces increasing environmental and societal concerns. Thus there might be long-term increases in publicly funded northern research and development. Input-output analysis can be used to show if the funds spent in the north from publicly funded northern research create output, GDP, income and employment impacts comparable to other northern industries. For the entire territorial economies the impacts may appear small. However it must be noted that since northern communities are quite small this means that the direct impacts of publicly funded research expenditures in particular small communities will likely have a significant impact especially if there are few sources of income.

5.4 Chapter Summary

This chapter explains that the most appropriate method to analyze the economic impacts of northern research activities was to use input-output multipliers. The input-output multiplier follows the same concept as the aggregate expenditure multiplier as they both produce identical current price estimates of GDP impacts. However, the aggregate expenditure multiplier only shows the impact of aggregate demand on income. The input-output multiplier is different because it may be broken down to determine multipliers for individual industries and sectors as well as economic indicators for not only income but also GDP, and employment.

According to the economic theory explained above publicly funded northern research expenditures had an impact on the income of local residents, as well as the output of producing industries, the GDP and employment in the region. The size of this impact depends on how much of the publicly funded northern research expenditures are spent on activities in the north versus in the southern provinces, as well as the marginal propensity to save and import by the local residences.

CHAPTER 6: METHODOLOGY

This chapter applies the economic theory discussed in Chapter 5. Four steps are involved in obtaining the results and are presented in the first part of this chapter. The first step involved analyzing the budget justifications in the research grant applications. The second step involved finding the territorial research expenditures of the agencies that did not provide budget justifications. In the third step expenditures were combined from each of the three territories to find the total local expenditures. The total local expenditures are the change in final demand resulting from new northern research expenditures. The fourth step involved multiplying this change in final demand by the Statistics Canada output, GDP, income and employment multipliers. The final portion of this chapter outlines potential estimation problems. The chapter is concluded with a summary.

6.1 Data Sources

This section explains how the expenditure data used to determine the impacts of publicly funded northern research in the Canadian Territories were obtained. Also discussed are the Statistics Canada input-output tables. Expenditure data was collected for the years 2000 to 2009. The northern research expenditures represent final demand shock in 8 industries. The impacts are estimated based on industry specific input-output multipliers found in Appendix C.

6.1.1 Budget Justifications

Using the Freedom of Information Act, detailed proposed expenditure data in the form of budget justifications were obtained from the Tri-Council, Sustainable Communities Initiative, Environment Canada's Northern Ecosystem Initiative, and the Polar Continental Shelf Project. The budget justifications contained the proposed amounts to be spent on salaries and benefits, equipment and facilities, materials and supplies, travel, dissemination and other relevant

activities necessary for the researcher to conduct their research. Information was also gathered from Annual Reports and other online resources for ArcticNet, Northern Contaminants Program (NCP), Northern Scientific Training Program (NSTP), Arctic Infrastructure Fund (AIF), and International Polar Year (IPY), although specific expenditures were not listed for these programs only yearly totals spent on research.

6.1.1.1 Tri-Council

Expenditure data, including budgets and budget justifications were obtained from the Tri-Council from 2000-2009. The data included expenditures for salaries and benefits, equipment or facilities, materials and supplies, travel, dissemination costs and other costs necessary for conducting the research. Salary and benefit costs are for students, postdoctoral fellows and technical/professional assistants. Equipment or facility costs are broken down into purchase or rental, operation and maintenance as well as user fees. Materials and supplies are a separate category while travel includes conference, field work and collaboration/consultation travel costs. Dissemination costs include publication costs as well as any other costs necessary for publication of the research results. The other category includes technology transfer activities, freight costs or any other particulars stated in the budget justifications. Total expenditures by the Tri-Council for the years 2000-2009 are shown in Table 6.1 below.

The expenditures were broken down into 11 Statistics Canada input-output industries using the budget justifications provided by the Tri-Council. The data was further broken down into local northern expenditures and expenditures outside the region.

6.1.1.2 Sustainable Communities Initiative

Canada's Sustainable Communities Initiative (SCI) provided budgets and budget justifications for research conducted in northern communities. The budget justifications included specific expenditures on equipment, hardware, software, data, training, expertise and others such as travel. However, they only provided funding for northern research between the years 2000-2005, the totals are shown in Table 6.1 below.

Like the Tri-Council this data was also broken down into Statistics Canada input-output industries using the budget justifications provided. The data was then further broken down into local northern expenditures and expenditures outside the region.

6.1.1.3 Environment Canada's Northern Ecosystem Initiative

Environment Canada provided budgets for the Northern Ecosystem Initiative (NEI) for the years 2000-2009. The budget justifications included expenditures for local field assistants, salaries and wages, training/modeling, travel (airfare), field transport, accommodation, food, overhead (admin) fees, office expenses, helicopter, equipment/materials, translating/interviewing, communications and community costs plus others such as taxi, shipping and analysis. Budget justifications were broken down similarly to the Tri-Council and SCI into the Statistics Canada input-output industries. The data were further broken down into local northern expenditures and expenditures outside the region.

6.1.1.4 Polar Continental Shelf Project

Polar Continental Shelf Project (PCSP) provided budgets for research conducted in the Canadian Arctic in 2009 only. The funds were categorized for each territory according to air, accommodation and field equipment costs. The total spent on northern research for 2009 by PCSP is $24,445,355, shown in Table 6.1 below.

Table 6.1: Total Proposed Expenditures per year ($)

Year	Tri-Council	SCI	NEI	PCSP	Total
2000	272,895	59,100	161,649		493,644
2001	421,850	516,065	689,531		1,627,446
2002	972,738	390,300	386,855		1,749,893
2003	741,724	133,454	86,862		962,040
2004	784,235	90,304	131,411		1,005,950
2005	1,282,917	22,804	151,470		1,457,191
2006	4,543,255		110,140		4,653,395
2007	5,420,238		392,782		5,813,020
2008	6,201,113		97,415		6,298,528
2009	3,234,164		50,000	24,445,355	27,729,519

6.1.2 Other Research Agency Expenditures and Data Limitations

Information on yearly northern research expenditures was gathered from Annual Reports and other online resources for the following publicly funded northern research programs: ArcticNet, Northern Contaminants Program (NCP), Northern Scientific Training Program (NSTP), Arctic Infrastructure Fund (AIF), and International Polar Year (IPY). ArcticNet was

inaugurated in 2004. The values for ArcticNet were found in their Annual Reports online. Specifically used in Table 6.2 is the amount spent on research projects between 2004-2009.

Aboriginal Affairs and Northern Development Canada (AANDC) lists the Northern Contaminants Program (NCP) funds each year on their website[10] from 2000-2006. Funds for the years 2007 and 2008 were obtained by contacting the Public Enquiries Contact Centre at AANDC, however, funds for 2009 were not provided by them.

The Northern Scientific Training Program (NSTP) provides annual reports on their website until 2006. The value used in Table 6.2 was obtained from the annual report in which they state the amount of money they dedicate to support university research each year.

In 2009 $85 million in government funding was dedicated for the Arctic Research Infrastructure Fund (AIF) to upgrade existing key Arctic research facilities, in which $55 million was spent in the Territories. Funding decisions were made in March 2009 and projects were allowed to take up to two years to complete. The AANDC website[11] lists each accepted project, the Territory in which the project took place and the amount of funds requested. However the breakdown of particular expenditures for each project was not stated (i.e. labour, materials, etc.). The total Territorial expenditures for AIF are listed below in Table 6.2.

Table 6.2: Other Research Agency/Programs Expenditures per year in the Canadian North

Year	ArcticNet	NCP	NSTP	AIF	IPY	TOTAL
2000		4,695,425	610,000			5,305,425
2001		4,252,099	662,000			4,914,099
2002		5,442,065	636,000			6,078,065
2003		5,404,264	636,000			6,040,264
2004	2,623,350	3,476,117	1,000,000			7,099,467
2005	3,591,797	4,448,284	919,000			8,044,792
2006	3,770,819	4,373,029				8,143,848
2007	3,838,049	4,259,399			44,814,825	52,912,273
2008	2,759,531	4,251,958			45,062,456	52,073,945
2009	3,137,858			55,539,590	23,292,050	81,969,498

The International Polar Year (IPY) website[12] lists the plans, spending and results of the IPY study. It started is April of 2006 and ended in March 2012. The federal funding allocation is $150 million over the five years. The 2007, 2008 and 2009 IPY funds are listed in Table 6.2

[10] http://www.ainc-inac.gc.ca/nth/ct/ncp/lfp/index-eng.asp
[11] http://www.ainc-inac.gc.ca/ai/mr/nr/j-a2009/bk000000260-eng.asp
[12] http://www.tbs-sct.gc.ca/hidb-bdih/initiative-eng.aspx?Hi=45

and sum to over $100 million. This causes a large increase in northern research funds from 2007-2009.

6.1.3 Statistics Canada Input-Output Model

The conventional input-output model explained in Chapter 5 is square and based on the fact that each industry produces one commodity and each commodity is produced by only one industry. The model produces a multiplier that shows the direct and indirect output requirements to meet the final demand. The initial impact of a change in final demand also creates numerous successive demands for intermediate goods and services. However, Canadian input-output tables are initially created in a rectangular format and are more complex. Rectangular input-output tables offer an advantage over square tables because they allow for more detail, are the actual observed transactions in the Canadian economy, and act as a statistical audit of the consistency, integrity and comprehensiveness of economic statistics (Lal, 1982). Also leakages such as imports are subtracted. Usually the Canadian open input-output model is used to calculate the total output by business sector industry necessary to respond to a given final demand expenditure or industry output shock within a defined period usually one year (Poole, 1995). Every year Statistics Canada creates three input-output tables known as the Make, Use and Final Demand matrices. All accounting in the intermediate demand or Use matrix is in terms of commodities and the output or Make matrix is in terms of industries. These matrices make it possible to model the sectoral demand or output for commodities due to a change in final demand. The Final Demand matrix shows production of commodities for final consumption (Statistics Canada, 1989).

The input-output tables are created on an annual basis by data obtained by surveys, tax records and other administrative sources in order to collect reliable statistics on each industry (Statistics Canada, 2001). The Make, Use and Final Demand tables incorporate all economic activities within the Canadian economy both at national and provincial/territorial levels. Economic activities include activities by people, businesses, government, non-profit organizations and industries that stimulate imports or exports.

Each classification consists of four levels of "hierarchy" the "W" worksheet, the "L" historical-link, the "M" medium and "S" small levels. The "S" level is the highest level of aggregation while "W" has the greatest number of categories. The "L" level is referred to as the

historical link level because it is the lowest level of aggregation for which industry definitions are relatively stable across the three Standard Industrial Classifications (Statistics Canada, 2010). Table 6.3 below shows that current "W" level account, created in 2007, consisted of 300 industries, 727 commodities and 172 final demand categories. Once the "W" level data is prepared and balance it is then aggregated into "L", "M" and "S" levels.

Table 6.3: Number of industries at each level of classification at national level (2007)

	"W"	"L"	"M"	"S"
Industries	303	117	62	25
Commodities	727	469	111	59
Final Demand	172	122	41	18

Looking at the simple input-output transaction Table 5.1, the Industry classification in Table 6.3 represents the column intermediate "producing" industries but excludes the "final demand" columns as these are classified on their own. The Commodity classification represents the row intermediate "consuming" industries and includes the "primary supply/value added" category rows.

The Canadian interprovincial input-output transactions table adds the final demand categories of exports and imports within each province and territory. National input-output tables are publicly available at the 'S', 'M' and 'L' levels. However, inter-provincial input-output tables are only publicly available at the 'S' level due to confidentiality reasons making it difficult to release provincial data at other levels of aggregation and simulation model services are available using 'W' level detail (Statistics Canada, 2010).

6.2 Break-Down of Expenditures

For each territory individually, as well as the Territories as a whole, the Tri-Council, SCI and NEI expenditures were broken down into 11 categories relating to the Statistics Canada Input-Output industries at the "W" level used in the Make and Use input-output tables. The total expenditure amounts and also the portion spent in the North were then found for each category. The categories were chosen based on the descriptions of the research activity provided in the budget justifications received, as well as the input-output industry classifications provided by Statistics Canada (Appendix A).

6.2.1 Tri-Council, SCI and NEI Expenditures

The Tri-Council, SCI and NEI all provided particulars on how their research money was to be spent. The total proposed expenditures received from Tri-Council (NSERC, SSHRC, and CIHR) were broken down into 6 categories.

1) Salaries and benefits to students, postdoctoral fellows and technical/professional assistants.
2) Equipment and facility: purchase or rental, operation, maintenance costs and user fees.
3) Materials and Supplies (i.e. office, lab and operating supplies).
4) Travel for conferences, field work and collaboration/consultation
5) Dissemination costs for publications and other activities (i.e. production of newsletters and posters).
6) Other

An explanation of proposed expenditures was also included in the data provided by the Tri-Council. The money proposed under each heading was justified by explaining what the money would be going towards. This included how much was going to be spent each year on: research assistantships, technical or field assistants and/or graduate students; the purchase or rentals of vehicles, user fees for laboratories, specialized equipment or sample analysis; costs of materials and supplies such as field equipment like tents, stoves, GPS, sampling equipment, and lab equipment such as slides; amount to be spent on air travel by plane, helicopter or ground travel and what the travel was for such as field work or conferences; also the costs for photocopying, slide and poster preparation and page charges for publications was also included in the proposed expenditures. These are just some broad examples of particular expenditures. Each study is different and therefore each had different expenditures.

The proposed expenditures received from SCI were broken down into two or three parts for each community being examined; SCI, Community and/or Partnership Contributions[13]. The SCI contributions consisted of hardware such as computers, plotters, software upgrades, software licenses, training and expertise. Community contributions from the local government included money for project management, GIS operator, work space, travel related to project coordination, administrative support and trainer salaries. Partnership contributions included funds for software

[13] Not all SCI projects had partner contributions

licenses and anything not provided for by SCI or the community that was necessary to conduct the research.

The data received from NEI included detailed budget information on the type of expenditures as well as the details of expenditures. The NEI contributions included details of the proposed funds for local field assistants, salaries and wages of graduate students and research assistants, training, air and ground transport, accommodation, food, overhead and administrative fees, office expenses, helicopter rental, equipment and materials, translations and local interviews, printing costs, as well as shipping and sample analysis.

After breaking down the data provided by the Tri-Council, SCI and NEI into detailed expenditure categories. The categories were then matched up with Statistics Canada input-output industries used in the Make and Use matrices. This was done so that Statistics Canada multipliers could be used.

6.2.2 Relevant Statistics Canada Industries

The Statistics Canada input-output industries chosen to be matched up to the expenditures categories, reflecting the closest category match, from the original proposed expenditures data are: universities (GS2100); other professional, scientific and technical services (541B00); other administration and support services (561A00); operating supplies (F10100); office supplies (F10200); laboratory supplies (F10400); all other ground passenger transportation (458A00), air transportation (421000), support activities for transport (488000), traveller accommodation (721100), food services and drinking places (722000). The codes in brackets are the "W" level industrial categories which are categorized at the most detailed level as shown in Table 6.3. The bracketed codes are shown so that they could easily be found in Appendix A: North American Industry Classification System (NAICS) based, "S", "M", "L" and "W" aggregation-level industries for use with the input-output tables, from 2002 onwards. Appendix A shows that the industrial categories are aggregated into 25 sectors each with its own subheadings.

Table 6.3 shows the relationship between Statistics Canada input-output industry classification and the Tri-Council, SCI and NEI expenditures. The university impacts are a result of the expenditures for graduate student salaries. There is a Statistics Canada industry classification for educational services but this was not used for graduate student salaries because

this industry classification does not include university educational services. University educational services are classified under the government sector (Appendix A).

Other professional, scientific and technical services impacts is related to the expenditures on services rendered by research assistants, translators, elders and other professionals such as hunters, analysts and scientists. The reason this industry classification was chosen is because these people provide professional, scientific and technical services. In addition the other sub headings under professional, scientific and technical services did not relate to the professional, scientific and technical services related to northern research, so they had to be classified under other. The other sub-headings are advertising and related services; legal, accounting, tax preparation, bookkeeping and payroll services; architectural, engineering and related services; computer systems design and related services.

Table 6.4: Comparison of Statistics Canada headings to Tri-Council, SCI and NEI expenditures

Statistics Canada Categories	Tri-Council, SCI and NEI expenditures
Universities (GS2100)	Graduate student salaries
Other professional, scientific and technical services (541B00)	Services rendered by research assistants, translators, elders, hunters, analysts and scientists, user fees for labs
Other administration and support services (561A00)	Phone, fax and photocopy expenditures, training, publishing
Operating supplies (F10100)	GIS, camping equipment, sampling equipment
Office supplies (F10200)	Computer equipment, photocopying machines
Laboratory supplies (F10400)	Slides, test tubes
All other ground passenger transportation (4B5A00)	Vehicle rentals, including snowmobiles and ATV's
Air transportation (421000)	Commercial air travel, small plane and helicopter rentals
Support activities for transport (488000)	Gasoline
Traveller accommodation (721100)	Hotel and other accommodation
Food services and drinking places (722000)	Food and incidentals

Other administrative and support services impacts are phone, fax, and photocopy expenditures as well as, training, and publishing. Other Statistics Canada category of administrative and support services was chosen for these expenditures because the other sub headings under administrative and support, waste management and remediation services did not

relate to these type of services rendered by northern research. The other sub-headings are: travel arrangement and reservation services; investigation and security services; services to buildings and dwellings; waste management and remediation services.

Operating supplies relate to the supplies needed to conduct the research such as GIS, camping equipment and sampling equipment so it was reasonable to assume that these types of expenditures should be classified under the Statistics Canada category operating supplies.

Office supplies relate to computer equipment, paper, pens, photocopiers and other office related supplies expenditures.

Laboratory supplies are slides, test tubes, plastic gloves and anything else needed in the lab and therefore the Statistics Canada category of laboratory supplies was chosen for these expenditures.

The sub headings relating to transportation are: truck transportation; urban transit systems; interurban and rural bus transportation; taxi and limousine services; all other transit and ground passenger transportation; pipeline transportation of natural gas; crude oil and other pipeline transportation; air transportation, rail transportation, water transportation; scenic and sightseeing transportations; and support activities for transportation. The Statistics Canada category all other transit and ground transportation was chosen for expenditures relating to vehicle rentals, including snowmobiles and ATVs. This category was chosen for these types of expenditures because the sub-headings under transportation and warehousing did not match the types of ground transportation used in northern research. The Statistics Canada category air transportation was chosen for expenditures on commercial air travel, as well as small plane and helicopter rentals which was the logical choice based on the options under the transportation and warehousing category. Support activities for transport impacts was chosen for expenditures on gasoline as this was the only logical choice based on the categories provided by Statistics Canada.

Under the Statistics Canada category of accommodation and food services the sub headings are traveller accommodation; RV parks, recreational camps, and rooming and boarding houses; and food services and drinking places. The category traveller accommodation was chosen for expenditures on accommodation while conducting research or collaborating with others. The category of food services and drinking places was chosen for the expenditures on food and incidentals.

Table 6.3 shows the Tri-Council, SCI and NEI total research expenditures, northern expenditures and the proportion of northern research expenditures to total expenditures. Below specific details on the allocation of northern research expenditures by the Tri-Council, SCI and NEI are examined as well as the total proportions spent in the North between the years 2000 to 2009. The total expenditures of the Tri-Council, SCI and NEI in the Canadian territories are a result of summing the expenditures in each territory. The expenditures for each territory are presented in a tabular form in Appendix B.

Table 6.5: Total Tri-Council, SCI and NEI Expenditures

	Statistics Canada Definition	Univer-sities	Other Prof, Sci and Tech Services	Other Admin and Support Services	Operating Supplies	Office Supplies	Lab Supplies	All other Transit and Ground Passenger Transport	Air Transport	Support Activities for Transport	Traveller Accomm-odation	Food Services and Drinking Places
2000	Total Exp. ($)	103,000	122,800	5,500	450	600	3,000	1,790	32,315	500	300	2,640
	Northern Exp ($)	0	2,000	0	0	0	0	1,500	0	500	0	2,640
	Proportion spent in North	0.00%	1.63%	0.00%	0.00%	0.00%	0.00%	83.80%	0.00%	100.00%	0.00%	100.00%
2001	Total Exp. ($)	157,500	125,800	1,000	24,250	6,600	6,000	7,790	89,290	0	3,620	0
	Northern Exp ($)	0	9,000	0	0	0	0	7,500	6,500	0	3,620	0
	Proportion spent in North	0.00%	7.15%	0.00%	0.00%	0.00%	0.00%	96.28%	7.28%	0.00%	100.00%	0.00%
2002	Total Exp. ($)	301,600	402,008	38,110	43,250	6,300	7,000	18,800	149,150	1,000	4,520	1,000
	Northern Exp ($)	0	24,650	1,000	0	0	0	18,700	13,000	1,000	4,520	1,000
	Proportion spent in North	0.00%	6.13%	2.62%	0.00%	0.00%	0.00%	99.47%	8.72%	100.00%	100.00%	100.00%
2003	Total Exp. ($)	224,420	290,296	39,100	36,700	5,500	8,158	13,000	123,300	0	0	1,250
	Northern Exp ($)	6,500	16,700	1,000	0	0	0	12,900	25,000	0	0	1,250
	Proportion spent in North	2.90%	5.75%	2.56%	0.00%	0.00%	0.00%	99.23%	20.28%	0.00%	0.00%	100.00%

Table 6.5 (Continued): Total Tri-Council, SCI and NEI Expenditures

	Statistics Canada Definition	Univer-sities	Other Prof, Sci and Tech Services	Other Admin and Support Services	Operating Supplies	Office Supplies	Lab Supplies	All other Transit and Ground Passenger Transport	Air Transport	Support Activities for Transport	Traveller Accomm-odation	Food Services and Drinking Places
2004	Total Exp. ($)	219,920	326,275	16,100	38,800	17,630	12,400	10,300	136,000	1,500	1,680	3,630
	Northern Exp ($)	0	25,455	1,600	0	0	0	10,300	28,200	1,500	1,680	3,430
	Proportion spent in North	0.00%	7.80%	9.94%	0.00%	0.00%	0.00%	100.00%	20.74%	100.00%	100.00%	94.49%
2005	Total Exp. ($)	418,429	378,401	148,425	48,613	11,431	6,500	31,620	228,335	750	5,735	4,678
	Northern Exp ($)	0	21,055	17,856	0	0	0	31,620	44,325	750	5,735	4,678
	Proportion spent in North	0.00%	5.56%	12.03%	0.00%	0.00%	0.00%	100.00%	19.41%	100.00%	100.00%	100.00%
2006	Total Exp. ($)	2,080,303	1,028,455	186,379	312,262	18,535	147,804	41,182	700,563	2,400	11,030	14,342
	Northern Exp ($)	0	125,280	36,200	0	0	0	38,832	110,625	2,400	10,405	13,142
	Proportion spent in North	0.00%	12.18%	19.42%	0.00%	0.00%	0.00%	94.29%	15.79%	100.00%	94.33%	91.63%
2007	Total Exp. ($)	2,491,262	1,210,648	160,922	308,219	23,168	160,634	48,182	982,283	5,110	16,100	13,711
	Northern Exp ($)	15,322	229,600	6,000	0	0	0	43,132	250,125	5,110	16,100	12,011
	Proportion spent in North	0.62%	18.97%	3.73%	0.00%	0.00%	0.00%	89.52%	25.46%	100.00%	100.00%	87.60%

Table 6.5 (Continued): Total Tri-Council, SCI and NEI Expenditures

	Statistics Canada Definition	Univer-sities	Other Prof, Sci and Tech Services	Other Admin and Support Services	Operating Supplies	Office Supplies	Lab Supplies	All other Transit and Ground Passenger Transport	Air Transport	Support Activities for Transport	Traveller Accomm-odation	Food Services and Drinking Places
2008	Total Exp. ($)	2,818,331	1,281,812	211,042	401,087	43,300	336,057	54,622	1,016,076	4,850	21,025	12,911
	Northern Exp ($)	8,522	271,780	7,300	0	0	0	47,352	241,475	4,850	20,400	12,911
	Proportion spent in North	0.30%	21.20%	3.46%	0.00%	0.00%	0.00%	86.69%	23.77%	100.00%	97.03%	100.00%
2009	Total Exp. ($)	1,388,349	474,520	206,892	169,065	24,950	215,367	44,237	676,458	5,210	18,000	11,117
	Northern Exp ($)	5,322	53,920	3,500	0	0	0	40,587	158,045	5,210	17,200	11,117
	Proportion spent in North	0.38%	11.36%	1.69%	0.00%	0.00%	0.00%	91.75%	23.36%	100.00%	95.56%	100.00%

It is shown that the greatest portion of northern expenditures occurred in the accommodation and food services sectors. An average of 87% of the total northern research expenditures dedicated to accommodation and food services is spent in the northern economy. This is expected because while conducting northern research most of the researchers, students and assistants spend a portion of their time doing field work in the northern territories. Therefore most of the money dedicated for accommodation, food and incidentals is paid to and supplied by people in the northern economy. The largest expenditure occurred in 2008 where Tri-Council, SCI and NEI researchers spent a total of $268,804 on accommodation and food services, of this approximately 96% was spent in the northern territories.

Also expected are the results of the operating, office, and lab supplies with no northern expenditures. This is due to the fact that operating, office and lab supplies are expensive to purchase in the territories compared to the southern provinces, therefore and all supplies were assumed imported (i.e. purchased in the southern provinces and not included in northern purchases). Like these industries, universities, in Table 6.5 also represent a small portion of expenditures, in fact no expenditure are recorded until 2007. The classification universities, represents monies paid for graduate students salaries. Student salaries are typically paid for by universities but northern expenditures are small as most universities are located in the southern provinces. The funds specified in the category other professional, scientific and technical services range from a low of 6% in northern expenditures in 2002 and 2005 to a high of approximately 20% in 2007 and 2008. The northern expenditures in this category are payments for elders, translators, hunters and meeting participants who provide professional and technical services to northern researchers. Southern expenditures include payments for research assistants, sample analysis, maintenance costs, and journal page charges associated with the dissemination of research results. The smallest total expenditures occurred in 2000 with just under $100,000 but then average around $350,000 each year until 2006 when expenditures increased to over $1M. Expenditures continued to increase to $1.3M in 2008 but then declined approximately $1M in 2009. The largest contribution to northern services totalled $271,981 in 2008 and represented 21% of the total cost.

Other administration and support services include services such as phone, fax and photocopy expenditures, as well as, training, publishing and user fees for labs and hall rentals.

The northern expenditures range from zero in 2000 to 31% in 2001. In the years 2002, 2003 northern expenditures were less than 2% but from 2004 to 2006 rose to approximately 15%, 12% and 19% respectively. From 2007 to 2009 northern expenditures dropped considerably to less than 5%. The reason for the large northern expenditures in 2001 is due to the fact that very little was spent on administration and support services in this year but a majority of it was spent in the north on a computer lab rental in the NWT. The largest northern expenditure in 2006 was $36,200 when the total was $193,529. However, the largest expenditures occurred in 2008 and totalled just over $210,000 with only $7,300 in northern expenditures.

The expenditures on vehicle rentals, including snowmobiles, and ATVs are included in the classification all other ground transit and ground passenger transportation. This is due to Statistics Canada input-output worksheet level classification codes not including classifications for rentals exactly, only taxi, bus, transportation and urban transit systems. Therefore ground rental expenditures were classified under all other transit and ground passenger transportation. The northern expenditures in this category average 92.9% of the total due to the fact that most of the costs are incurred when researchers are conducting fieldwork in the North. In order to get to remote areas, researchers must rent trucks, ATV's and snowmobiles directly from the territory in which the research is being conducted. Southern expenditures do occur, although minimal, due to researchers renting vehicles to either reach southern research sites or collaborate with others. The lowest proportion of northern expenditures occurred in 2000 with just under 70%, however the expenditures in this year are very minimal with a total budget of only $1,790 with $1,250 in northern expenditures. From 2001 to 2004 expenditures averaged around $13,700 but then increased approximately 30% between the years 2005 to 2009, reaching a peak at $54,622 in 2008 with $47,352 in northern expenditures.

The category support services for transport represents a small portion of the budget but is dedicated for the purchase of gasoline. This could have been included in ground transportation but since it was specified in the budget justifications it was included. If fuel was purchased in that year for a rental vehicle it was purchased in the North. The largest expenditures occurred between the years 2007-2009 with the largest expenditure of $5,210 occurring in 2009. This value may be higher but gasoline expenditures may have been included in the rental price of the vehicle resulting in these expenditures being classified under the 'other passenger and ground transportation' category.

The expenditures for air travel are represented by funds spent on commercial airfare, as well as, small plane and helicopter rental. Most researchers are provided funding to purchase return airfare plane tickets to conduct fieldwork. These tickets are assumed to be purchased from an airport located south of the border so are considered southern expenditures. Once researchers, students and assistants reach the North small plane and helicopter rentals are necessary to conduct fieldwork, therefore those expenditures are classified as northern expenditures. In 2000 no small plane or helicopter rentals were reported and only 1% was reported from 2001 to 2002. Northern expenditures do increase from 2003 to 2009 averaging approximately 20% and go as high as 26% in 2007. Expenditures steadily increased from 2001 on and go from just over $100,000 to $709,063 in 2006 with northern expenditures ranging from $6,500 to $110,625. The largest total expenditures occurred between the years 2007 and 2008 in which they amounted to over $1M in both years, with average expenditures over all years being $250,000 in northern expenditures per year.

6.2.3 PSCP, NEI Uncategorized and AIF Expenditures

The budget justification provided by the Polar Continental Shelf Project (PCSP) was for 2009 only and contained information on the money spent for air travel, accommodation and field equipment for each territory. In order to find out the total northern expenditures, the proportion spent in the territory on the category, was multiplied by the total category expenditure. For example, in the NWT the PCSP spent $369,154.75 on air travel. However, using the data from the Tri-Council, SCI and NEI it was found that the proportion of air travel expenditures in the NWT for 2009 was 31%. By multiplying the total expenditure by the northern proportion it was found that PSCP contributed approximately $114,437.97 towards northern air travel in 2009. This was then added to the Tri-Council, SCI and NEI northern research expenditures totals.

NEI provided budget justifications but not for all research projects. These studies specified the territory and the year in which the research was conducted but not specific expenditures. In order to determine the northern expenditures, the proportion of research money spent in a specific territory each year (calculated using the Tri-Council, SCI and NEI data) was multiplied by the total research expenditures in that year. The value was then added to the Tri-Council, SCI and NEI northern research expenditures totals just like the PSCP contributions.

On the AANDC website mentioned earlier, AIF expenditures were listed according to the territory the project took place and the amount of funds requested for each project. Since the particular expenditures for each project are not stated, northern expenditures were calculated for AIF in the same way as NEI.

6.2.4 Other Expenditures

Other expenditures include those by ArcticNet, NCP, NSTP, and IPY and could only be found on a yearly basis. First, in order to find out how much was spent in each territory on each category, the total for each year was multiplied by the proportion of Tri-Council, SCI and NEI research money dedicated to northern research in all territories. This gave a breakdown of how much was spent in each category for all of the territories. The second step involved multiplying the total spent in each category by the specific proportion spent in each territory the same way that the territorial NEI uncategorized and AIF expenditures were found. Once the funds were broken into specific northern expenditures for ArcticNet, NCP, NSTP, and IPY, the values were added to the Tri-Council, SCI, NEI and AIF northern expenditures to quantify total northern expenditures from research initiatives.

6.2.5 Total Northern Expenditures

Table 6.6 shows the total northern research expenditures in each category relating the northern research. These expenditures are a result of the northern research expenditures by the Tri-Council, SCI, NEI, PSCP, AIF, ArcticNet, NCP, NSTP and IPY. The total northern research expenditures in each industry are interpreted in the present research as the final demand shocks or the increases in final demand. The industry headings in Table 6.6 represent the purchasing sectors in the simple input-output transaction table (Table 5.1).

The total northern expenditures in each purchasing sector are then multiplied by the corresponding Statistics Canada multipliers to obtain the total direct and indirect impacts on output, GDP, income and employment due to northern research on the Canadian Territories.

Table 6.6: Total Northern Research Expenditures 2000-2009 ($)

Northern Expenditures (Final Demand Shocks)									
Year	Universities	Other Professional Services	Other Admin Services	Ground Transport	Air Transport	Support for Transport	Accomm-odation	Food	**Total**
2000	0	263,131	0	5,028	0	12,598	106,227	99,497	**486,481**
2001	0	191,108	28,161	157,940	81,482	0	405,935	0	**864,627**
2002	0	179,716	11,862	122,422	84,694	1,142	84,923	30,212	**514,971**
2003	0	329,188	8,234	108,473	185,725	0	83,145	19,093	**733,860**
2004	0	131,425	14,754	43,050	109,254	5,691	73,706	34,159	**412,039**
2005	0	120,840	77,064	132,496	167,014	758	109,285	61,350	**668,807**
2006	0	356,422	94,831	61,197	215,752	4,570	102,711	147,870	**983,355**
2007	159,095	2,711,661	86,207	204,549	1,729,708	11,541	307,067	264,034	**5,473,869**
2008	82,607	2,713,014	72,349	172,536	1,548,855	10,892	367,929	294,823	**5,263,007**
2009	477,999	657,056	42,466	180,716	2,886,067	13,957	384,060	1,177,438	**5,819,761**

6.2.6 Statistics Canada Multipliers

The territorial multipliers from Statistics Canada's input-output model provide estimates of the direct and indirect impacts of a change in final demand on the territorial economy. As defined earlier direct impacts are those experienced by industries providing the goods and services for which research expenditures are made and employing additional labour to produce that output. Indirect impacts result when the additional demand for the products of an industry leads that industry to purchase additional inputs from other firms to meet their increase in demand.

Statistics Canada provides different types of multipliers, specifically output, GDP, income and employment. Output multipliers represent the change in the output of intermediate producing industries due to a change in final demand. The idea is that a one dollar change in final demand leads to more than a one dollar change in new output. This is because the output multiplier provides an estimate of the production by all other industries used in the production of one dollar of output by the given industry (Ziad, 2010).

The GDP multiplier represents the total impact on income-based GDP, including all indirect activities, of any exogenous demand for the outputs of an industry, but excluding that portion of the value of the outputs of the industry that is payment for imports or factors of production residing in another jurisdiction (Ziad, 2010). That is, it is a multiplier indicating the 'value-added' impact. The GDP multiplier is obtained by weighting the contribution of each industry by its GDP-to-output ratio. Because payments to factors of production in other jurisdictions are excluded, the GDP multiplier is always less than one. In fact, the use of ratios to total industry output provides the means to estimate the impacts of any exogenous shock on many variables including all GDP components and employment. Since income is a component of GDP it is possible to derive a multiplier for income by using a ratio of income-to-output and thus the income multiplier is also less than one. The income multiplier used in this study represents the changes in (territorial) wages and salaries due to an increase in final demand. Employment-to-output ratios can be used to calculate employment multipliers. Employment multipliers represent the change in employment due to the direct and indirect impacts. The employment multiplier used in this thesis represents the number of jobs created per million dollars spent, by industry.

6.3 Determining the Direct and Indirect Impacts of Publicly Funded Research in the Canadian Territories

In order to determine the direct and indirect output impacts of publicly funded research in the Canadian territories two steps were taken. First the change in final demand (i.e. local northern expenditures) for each relevant industry was quantified. It was found that eight northern industries experienced a change in final demand due to publicly funded research in Canada. The second step involved multiplying the change in final demand for each of the eight industries by the appropriate output, GDP, income and employment input-output multipliers to estimate the direct and indirect impacts experienced by each industry each year.

Using the information contained in the 2009 Statistics Canada User's Guide to the Canadian Input-Output Model, the change in final demand in each of the eight industries was multiplied by the Statistics Canada input-output direct and direct plus indirect 'output' multipliers for each territory, each year to generate total impacts. To estimate the GDP impacts within the region the final demand changes in each of the eight industries are multiplied by the corresponding Statistics Canada input-output 'GDP' multiplier, similarly to estimate the change in income due to an increase in final demand the change in final demand is multiplied by the corresponding Statistics Canada input-output 'wages and salaries' multipliers. The employment multipliers represent direct and direct plus indirect effects on the number of jobs generated per million dollars of increased final demand. Therefore the employment generated by the increase in final demand due to northern research expenditures is based on the amount (i.e. $millions) of the increase in output. Thus the total expenditure increases (in $millions) were multiplied by the Statistics Canada 'employment' multiplier to find the number of jobs generated in the North by publicly funded research. The various Statistics Canada multipliers for each territory each year are reported in Appendix C.

6.4 Potential Estimation Problems

Four steps were involved in obtaining the output, GDP, income and employment impacts in the Canadian Territories due to publicly funded research. The first two steps involved obtaining the final local expenditures. First results were obtained by analyzing the budget justifications provided by the Tri-Council, SCI and NEI. Secondly the values of total research

expenditures by other research agencies were obtained on either a territorial and yearly basis or just a yearly basis. These values were published online either on their website or annual reports. The third step involved combining expenditures from each of the three territories to find the total local expenditures. The total local expenditures are the change in final demand. Finally the change in final demand was multiplied by the Statistics Canada output, GDP, income and employment multipliers.

A potential estimation problem is caused when the lump sum expenditures in certain industry categories were combined. For example, some budget justifications stated a lump sum for travel and accommodation or included meals in accommodation costs. In the case of travel and accommodation, the value was included in the travel category. If the budget just stated a lump sum for meals and accommodation the value was included in the accommodation category. Also values for support services for transportation are likely understated, as the amount spent in this industry was typically not specified and most likely combined with the transportation expenditures. Therefore the direct expenditures in these categories may not be as accurate as the service industries.

Another potential estimation problem comes in the second step as only northern research programs and agencies that have published specific details of yearly (or territorial) northern research expenditures on the web are included in the analysis. Also agencies may not have published expenditures up to 2009. This means that the results are likely understated, especially in years where public research was conducted in the Territories but not included in the local expenditures.

Another potential problem could arise in the third step because it is assumed that all public research agencies have the same spending patterns in each year. Estimation problems occurring in the second step may potentially be due to converting the annual lump sums into categories using the original budget justifications from the first step. This may cause problems if real research expenditures were not proportional to the original budget justifications. However, converting the annual figures is necessary to develop more accurate impacts on the northern economy due to northern research and to apply the appropriate multipliers. This means if an anomaly occurred in the original budget justification the irregularity will carry through the whole process. Also potential estimation problems occur in the first step with using the budget justification data due to the budgets being predicted values and not actual.

A potential problem that could arise in the fourth step is that the data was not correctly categorized, thus using the wrong multiplier to obtain the results. Only very specific Statistics Canada industry categorizations could be found and not a complete description of the industries specified in each category. Also the 2007 multipliers were used to obtain results for 2008 and 2009, so results will be less accurate in these years, although the multipliers in each industry do not change significantly from year to year.

Overall the methodology presented in this section will provide novel results for the total economic impact of publicly funded research expenditures on the northern territorial economies. This is due to the initial expenditure data being provided by actual budget justifications submitted by researchers to actual research agencies who have supported northern research. Thus the initial expenditure data is factual. Although breaking down other research agency expenditures in the same proportion may cause some inconsistencies, most public research agencies operate in much the same way. The annual multipliers obtained by Statistics Canada for each territory are created using provincial input-output tables and are used by governments as well as private and public institutions to calculate direct and indirect economic impacts of new institutions and changes in existing industries due to a change in final demand. Thus using the same multipliers in this analysis will give detailed results as to the impact northern research has on the northern territorial economy.

6.5 Chapter Summary

In this chapter it was reported that publicly funded research involved expenditures in eleven industries but only eight industries in the territories experienced a change in final demand due to publicly funded northern research expenditures. This chapter showed how the changes in final demand were estimated for the eight industries in the territories. The value of the final demand changes in each of eight territorial industries was also reported.

This chapter also discussed that by using the multipliers obtained from the Statistics Canada the multiplier effects within the territorial economy due to a change in final demand can be estimated. The last portion of this chapter explained how these multipliers will be used to find the direct and indirect impacts on output, GDP, income and employment in the territories due to publicly funded northern research.

CHAPTER 7: RESEARCH RESULTS

In this chapter, results are presented for the study objectives and in support of the alternative hypothesis that northern research expenditures will have a measureable impact of the territorial economy. The first objective was to determine the direct and indirect output, GDP, income and employment impacts due to a change in final demand. The change in final demand is due to initial expenditures from conducting publicly funded northern research in the territorial economies. The direct and indirect output, GDP, income and employment impacts are found by applying the relevant Statistics Canada input-output multipliers to the final demand changes in territorial industries due to publicly funded northern research. Results are obtained on the direct and indirect impacts due to publicly funded northern research expenditures within the Canadian territories. These are based on expenditures in territorial industries, as reported in Chapter 6 and Appendix B. The second objective was to compare the final demand impacts of northern research to simulated final demand impacts of a similar size in other relevant industries from Chapter 2.

The first part of this chapter reports the results for the first objective by discussing the direct and indirect economic impacts of activities associated with publicly funded northern research between the years 2000 to 2009. The second section compares the total territorial economic impacts of northern research to the economic impacts in other industries discussed in Chapter 2. This is done by hypothetically introducing an increase in final demand within the relevant industries by the same amount as the initial northern research expenditures. The final section determines if the hypothesis will be rejected.

7.1 Direct and Indirect Impacts in the Canadian Territories due to Publicly Funded Northern Research

The expenditures for various activities associated with publicly funded northern research cause impacts within the economy due to changing the final demand in various sectors in the

economy. In this chapter the direct and indirect impacts on output, GDP, income and employment for the Canadian territories are calculated. Appendices, D, E, F and G report the yearly direct and total (direct plus indirect) output, GDP, income and employment impacts for the industries experiencing a change in final demand and each territory. By adding up the individual territorial data from Appendices D, E, F and G, the total impacts on output, GDP, income and employment were estimated for the territories as a whole.

The output impacts are those experienced by the economy as a whole. The GDP impacts are of interest because they represent the impacts to all final goods and services produced within the territories in terms of value-added. In this thesis the income impacts represent the impacts on wages and salaries of territorial households due to northern research. Employment impacts represent the number of jobs created per million dollars spent in the territories on northern research.

Each type of impact was derived from multiplying the final demand changes (i.e. northern expenditures) obtained for each territory by the appropriate direct and direct plus indirect Statistics Canada multipliers for each industry experiencing final demand changes. Table 7.1 reports, for example, the multipliers used for the Northwest Territories in 2007. The complete suite of multipliers for all relevant years and for all northern territories is reported in Appendix C. The total impacts were found by summing the results from all three territories and are presented in Table 7.2.

Table 7.1: Statistics Canada direct and direct plus indirect multipliers Northwest Territories (2007)

	2007							
	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	# of Jobs (per million $)	Wages and Salaries	Total GDP	Output	# of Jobs (per million $)
Universities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.44	0.59	1.00	11.25	0.49	0.69	1.19	12.13
Other Administrative and Support Services	0.75	0.83	1.00	11.12	0.77	0.88	1.10	11.58
All other Transit and Ground Passenger	0.22	0.79	1.00	11.76	0.24	0.83	1.08	12.12
Air Transport	x	x	x	x	0.21	0.39	1.26	3.33
Support for Transport	x	x	x	x	0.39	0.65	1.32	5.46
Traveller Accommodation	x	x	x	x	0.42	0.72	1.21	8.44
Food Services and Drinking Places	0.33	0.50	1.00	11.63	0.37	0.58	1.15	12.35

As mentioned in Section 6.2.6 the total GDP multiplier is less than one because it is a value-added measure of output. The wages and salaries multiplier is also less than one because it is a ratio of wages and salaries to output. The direct output ratio is one because it represents the direct change in final demand. The direct plus indirect output ratio is thus greater than one because the output multiplier provides an estimate of the production by all other industries used in the production of one dollar of output by the given industry (Ziad, 2010).

As shown in Table 7.1 the air transport, support activities for transport and traveller accommodation direct impact GDP, income and employment multipliers were not publicly available in order to meet the confidentiality requirements of the Statistics Act (Statistics Canada, 2007). The values shown below for these industries represent the total (direct plus

indirect) impacts as the direct impact multipliers were not specified. This means that the ratio of direct and indirect impacts for GDP, income and employment cannot be estimated for the air transport, support for transport and traveller accommodation industries.

7.1.1 Total Direct and Indirect Output Impacts

Publicly funded northern research in the Canadian Territories was estimated to provide a total of $24.8 million in total (direct plus indirect) output within the territories themselves from 2000 to 2009 (Table 7.2). Figure 7.1 shows that on average other professional, scientific and technical service as well as the air transport activities accounted for largest share of the indirect and direct output impact for the region, averaging 32% in all 10 years. Figure 7.1 and Table 7.2 shows the second largest output impacts occurred in the traveller accommodation sector which experienced an average of 11% of the output impacts each year. University impacts were zero for all ten years and support for transport categories were minimal accounting for only 0.002% of the impacts in all ten years.

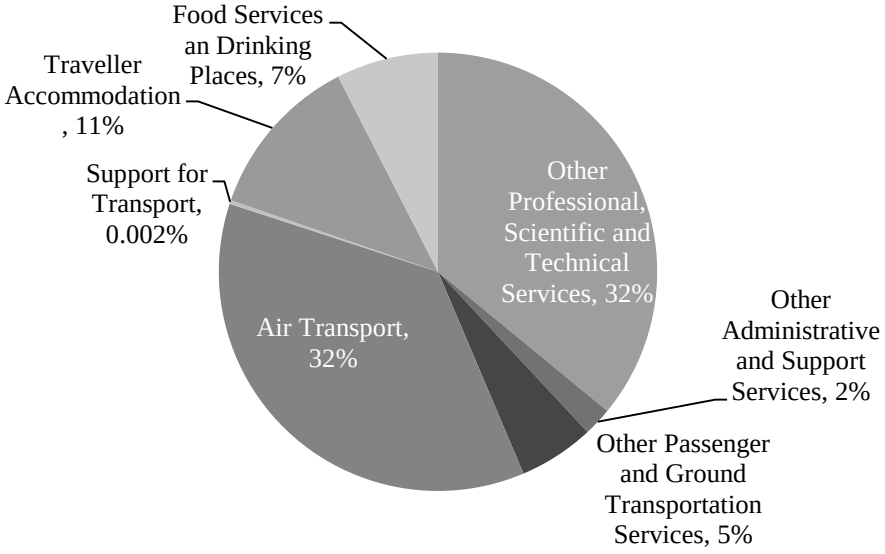

Figure 7.1: Average Activity Share of the Total Output Impact for Publicly Funded Northern Research in the Canadian Territories (2000-2009)

The impacts for each research activity relative to the overall impact of research expenditures, expressed as percentages, were estimated by dividing the individual total (direct plus indirect) industry output impacts by the total output impact from all ten years. For example, Table 7.2 shows that the total final demand impact for air transport from 2000 to 2009 is $8.9

million and the total final demand impacts for all industries is $24.8 million, thus the average activity share is 36% (8.9/27.9 x 100).

The total (direct plus indirect) annual output impacts for each activity are presented in Figure 7.2 and Table 7.2 reports numerically the direct and total (direct plus indirect) annual output impacts for each activity. Publicly funded northern research output impacts represent the changes in other industries output required to produce northern research. The output impact shown for each industry is found by multiplying the final demand increase in each territory each year by the appropriate multiplier, the values for each territory are then added together to estimate the northern public research total output impacts breakdown by activity 2000-2009 (Table 7.2).

Based on the results reported in Table 7.1 the direct output multiplier is one and thus the direct impact is the same as the northern expenditures (final demand impact). The northern expenditures for each territory are found in the output tables in Appendix D. In 2007 the northern expenditures in the Northwest Territories was $338 thousand. The total (direct plus indirect) multiplier for the professional, scientific, technical industry is 1.10 in 2007 for the Northwest Territories (Table 7.1). The northern expenditure (i.e. final demand shocks) for this industry in the Northwest Territories is multiplied by 1.1 to obtain the total output impact for this industry. The direct and total output impacts for Nunavut and the Yukon were then found using the same steps. The impacts for all three territories were then added together. The multipliers for each territory are found in Appendix C.

University impacts are not shown in Figure 7.2 because university impacts did not occur from 2000 to 2009. Although northern expenditures (i.e. final demand impacts) occurred between 2007 and 2009 the multipliers were zero[14]. Also impacts occurring in the support for transport industry are not shown in Figure 7.2 as these output impacts are minimal and are zero in 2001 and 2003. However, Table 7.2 does show the results obtained for industries involved in supporting transportation because some output impacts do occur. This is due to the fact that no or minimal expenditures by northern researchers on support activities for transport occurred during these years.

[14] University output multipliers are zero because there are no universities in the North. The final demand impacts reported in Table 6.6 are for Inuit summer students living in the north but attending university in the southern provinces.

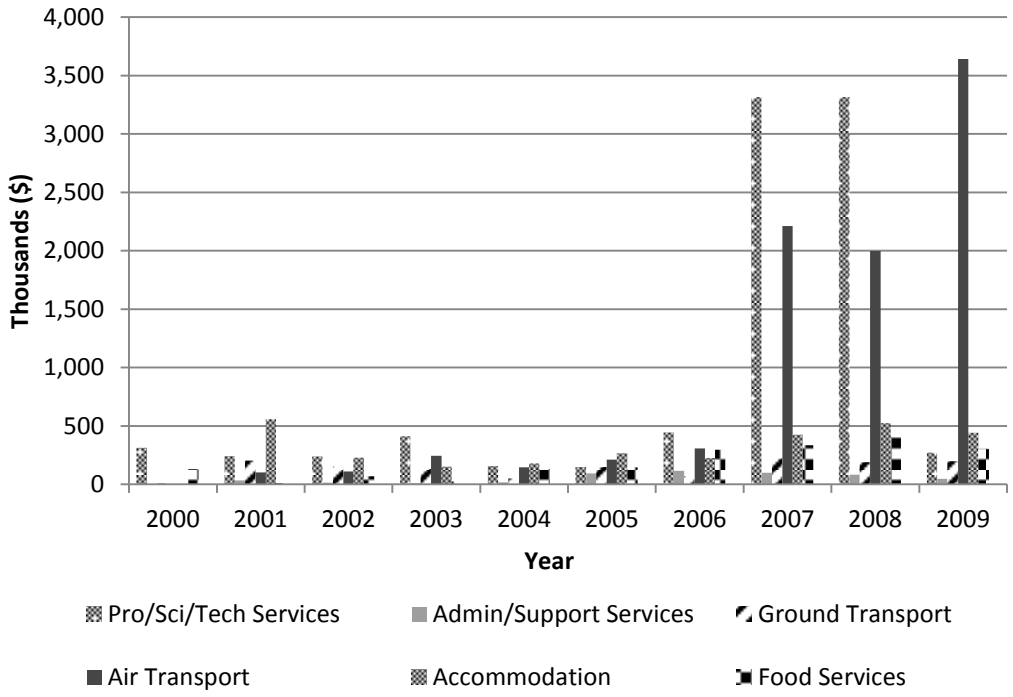

Figure 7.2: Total Territorial Output Impacts per year due to Publicly Funded Northern Research (2000-2009)

For the industries involved in other professional, scientific and technical services the share of the direct output impacts in 2000, 2003, 2007 and 2008 is large, averaging 50% of the total in each year. This means that in four years out of the ten reviewed, on average 50% of the direct output impacts occur in the other professional, scientific and technical service industry. For the years 2000 to 2006 output impacts remain low averaging under $300 thousand dollars but increase dramatically in 2007 and 2008 to over $3.3 million in total output impacts and declines in 2009 to only $272 thousand in direct plus indirect output impacts.

Table 7.2: Northern Public Research Total Output Impacts Breakdown by Activity 2000-2009 (Thousands, $)

		Output Impacts (Thousands, $)								
		Univer-sities	Other Professional/ Scientific/ Technical Services	Other Admin/ Support Services	All other Transit and Ground Passenger	Air Transport	Support Activities for Transport	Traveller Accommodation	Food Services and Drinking Places	Total
2000	Direct	0	263	0	5	0	13	106	106	493
	Total	0	314	0	6	0	16	125	130	591
2001	Direct	0	191	28	158	81	0	405	8	871
	Total	0	242	33	204	103	0	556	9	1,146
2002	Direct	0	203	13	122	85	1	85	53	563
	Total	0	239	15	154	110	2	229	69	817
2003	Direct	0	329	8	108	185	0	83	22	736
	Total	0	412	10	132	244	0	153	26	977
2004	Direct	0	x	15	43	109	6	74	108	355
	Total	0	158	18	51	145	8	180	131	691
2005	Direct	0	121	77	132	167	1	109	122	729
	Total	0	149	95	149	211	1	266	147	1,018
2006	Direct	0	356	95	61	216	5	103	241	1,077
	Total	0	444	116	68	308	7	226	297	1,467
2007	Direct	0	2,712	86	205	1,730	12	307	287	5,339
	Total	0	3,316	100	223	2,213	16	425	337	6,631
2008	Direct	0	2,713	72	173	1,549	11	368	345	5,231
	Total	0	3,317	84	189	1,997	15	525	406	6,533
2009	Direct	0	227	42	181	2,886	14	384	261	3,995
	Total	0	272	47	198	3,643	18	443	304	4,925
Sum of Total Impacts		0	8,863	518	1,374	8,975	83	3,128	1,856	24,796

For the industries involved in other administration and support services, the share of the economic output impacts is minimal. No output impacts are recorded in the year 2000 because there were no expenditures by northern researchers on other administration and support services during this year. However, the largest output impacts occurring in this industry were recorded in 2006 amounting to approximately $116 thousand but steadily decline thereafter.

For industries involved in the all other transit and group passenger services category the total output impacts range from a low of $51 thousand in 2004 to a high of $223 thousand in 2007. Total output impacts remain steady through 2008 and 2009 averaging $195 thousand.

For the air transportation services industry there were no output impacts reported in 2000 because no expenditures by northern researchers on air transportation occurred in this year. However, total output impacts increase each year after that, slowly at first from a low of $103

thousand in 2001 to just over $300 in 2006 than total impacts increased drastically to over $2 million in 2007 getting as high as $3.6 million in 2009.

Traveller accommodation output impacts remain relatively low between the years 2000 to 2005 averaging $75 thousand except in 2001 when the largest output impacts occurred totalling more than $500 thousand. From 2007 to 2009 the output impact increased drastically averaging $450 thousand each year.

For most years, industries involved in the food and beverage industry see a small share of the economic output impact. In 2000 the direct and indirect impacts were estimated to be $130 thousand. However between 2006 and 2009 impacts increase dramatically peaking at just over $400 thousand in 2008 and decreasing to just over $300 thousand in 2009.

Comparing the total direct and indirect output impacts shown in Table 7.1, the indirect output impacts are at least 20% of the total impact in all ten years. For example, the largest share of the indirect output impact occurred in 2003 when the direct output impact was $736 thousand dollars and the total economic output impact was $977 thousand meaning that the indirect output impact was $241 or 33% of the total output impact. The direct output impact for all ten years totals $19.3 million dollars, with $5.4 million in indirect impacts, meaning the total economic output (i.e. contribution) of publicly funded northern research is equal to $24.7 million dollars from 2000-2009. However, as Figure 7.3 below shows 65% of the output impacts occurred between 2007 and 2009.

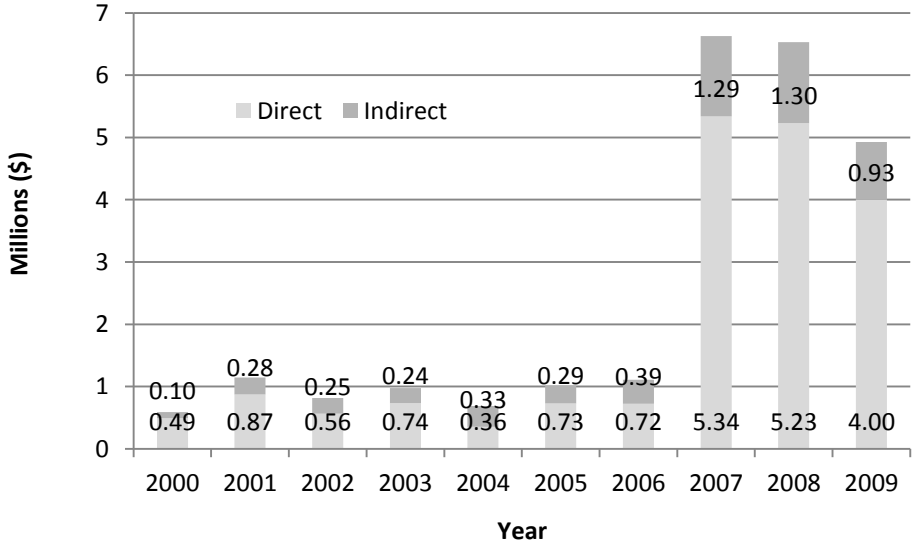

Figure 7.3: Territorial Total Direct and Indirect Output Impacts per year due to Public Research (2000-2009)

For the years 2000 to 2006 the total output impact averages around $1 million a year but drastically increases between the years 2007 and 2009 to almost $7 million in direct and indirect output impacts each year.

7.1.2 Total GDP Impacts

Table 7.3 shows the direct and total (direct plus indirect) impacts of northern research on the territorial GDP at basic prices[15] on a yearly basis. The direct values show the direct impact made based on the GDP at basic prices. The GDP impact shown for each industry is found by multiplying the final demand increase in each territory each year by the GDP multiplier, the values for each territory are then added together to form: Total GDP impacts for Canadian Territories broken down by activity (Table 7.3). Looking at Table 7.1 the Northwest Territories direct and total GDP multipliers are 0.59 and 0.69 for the professional, scientific, technical industry. The multiplier is less than one because the GDP multiplier is obtained by weighting the contribution of each industry by its GDP-to-output ratio.

In 2007 the research expenditures in the Northwest Territories was $338 thousand. The direct GDP multiplier for the professional, scientific, technical industry is 0.59 in 2007 (Table 7.1). The northern expenditure (i.e. change in final demand) for this industry in the Northwest Territories is multiplied by GDP multiplier 0.59 to obtain the direct GDP impact for this industry. Similarly, the total GDP impact for the Northwest Territories was found by multiplying the change in final demand by the total GDP multiplier of 0.69 to find the total GDP impact for that territory. The direct and total GDP impacts for Nunavut and the Yukon were then found using the same steps. The impacts for all three territories were then added together to form Figure 7.4 and Table 7.3. The multipliers for each territory are found in Appendix C.

Examining the total GDP impacts in Table 7.3 the total GDP impacts were $304 thousand in 2000, vary slightly between 2001 and 2005 but overall the values increase to just over $726 thousand in 2006 and then the impacts increase drastically to over $3 million, in 2007 and 2008. However total GDP impacts decreases slightly in 2009 to approximately $2.6 million. In 2007 the territorial GDP in current prices totalled $7,753 million (Statistics Canada Table 384-0002).

[15] GDP at basic prices includes net indirect taxes (indirect taxes less subsidies)

This means that publicly funded northern research accounted for only 0.04% of the total territorial GDP for that year.

Table 7.3: Total GDP impacts for Canadian Territories, Breakdown by Activity 2000-2009 (Thousands, $)

		GDP Impacts (Thousands, $)								
		Univer-sities	Other Professional/ Scientific/ Technical Services	Other Admin/ Support Services	All other Transit and Ground Passenger	Air Transport	Support Activities for Transport	Traveller Accommo dation	Food Services and Drinking Places	Total
2000	Direct	0	113	0	3	x	x	x	49	
	Total	0	152	0	8	0	7	77	61	304
2001	Direct	0	62	20	89	x	x	x	3	
	Total	0	87	22	108	36	0	305	4	563
2002	Direct	0	75	6	75	x	x	x	21	
	Total	0	99	9	91	39	1	117	28	384
2003	Direct	0	152	6	68	x	x	x	11	
	Total	0	198	7	82	84	0	83	13	466
2004	Direct	0	77	10	28	x	x	x	48	
	Total	0	96	12	33	45	3	98	60	346
2005	Direct	0	65	48	98	x	x	x	55	
	Total	0	80	57	107	69	0	142	67	522
2006	Direct	0	164	62	46	x	x	x	108	
	Total	0	224	74	50	103	3	122	150	726
2007	Direct	0	1,488	64	159	x	x	x	139	
	Total	0	1,818	72	169	689	7	248	165	3,169
2008	Direct	0	1,491	54	134	x	x	x	164	
	Total	0	1,821	61	142	621	7	304	197	3,152
2009	Direct	0	365	35	140	x	x	x	148	
	Total	0	443	37	149	1,525	9	298	175	2,637
Sum of Total Impacts		0	5,017	351	938	3,211	38	1,793	921	12,269

x - multipliers were not available due to confidentiality reasons

Figure 7.4 shows that the largest impacts were felt by the other professional, scientific, technical service industries. It was found that the final demand shocks incurred by the university industry did not result in any GDP impacts as the multiplier is zero every year for all three territories and the support services for transport industry experienced very minimal impacts.

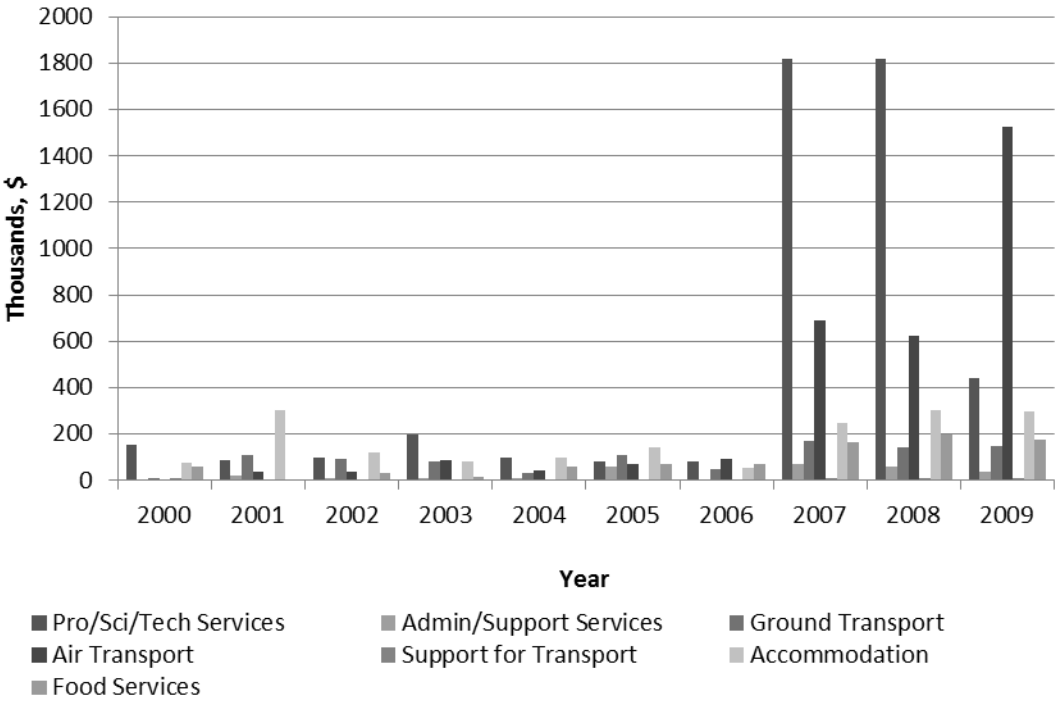

Figure 7.4: Total GDP impacts for Canadian Territories (Thousands, $)

For the other professional, scientific, technical service industries, the greatest impacts to GDP clearly occurred in 2007 when impacts reached over $1.8 million and contributed to 58% of the total GDP impacts in that year. Before 2007 impacts never reached above $225 thousand. However in 2009 GDP impacts decreased to just under $500 thousand. Indirect impacts on average are 22% of the total each year for the other professional, scientific, technical service industries.

For the other administrative and support service industries no GDP impacts were recorded in 2001. Impacts peak at $72 thousand in 2007. Before 2005 GDP impacts averaged $12 thousand dollars but drastically increase to over $50 thousand in 2005 reaching a peak of over $74 thousand in 2006. In 2009 total GDP impacts were $37 thousand. On average indirect impacts in the other administrative and support service industries are 14% of the total impacts.

For transit and ground passenger transportation the largest GDP impact occurred in 2007 at approximately $169 thousand and decreased slightly to just over $149 thousand in 2009. Before 2007, GDP impacts ranged from approximately $8 to $107 thousand. Indirect GDP

impacts for this category were on average 15% of the total except from 2007 to 2009 where the indirect impacts were only 6% of the total.

In 2000, the food and beverage service industries experienced just over $60 thousand in GDP impacts but this amount decreases to approximately $4 thousand in 2001. In 2002 the impacts increase to $28 thousand but decrease back down to $13 thousand in 2003. In 2004 a large increase in GDP impacts occurred doubling the amount seen in 2002. In 2005 the GDP remained steady, increase approximately $150 thousand in 2006 and then increased again in 2007 to reach a total of over $165 million. In 2008 the GDP impact increases further to just under $200 thousand but then decreases to approximately $175 thousand in 2009. The proportion of indirect impacts is on average 20% of the total.

The following section deals with the impacts occurring in the air transport, support activities for transport and traveller accommodation industries. Direct GDP impacts could not be found for these industries as the direct GDP multipliers are not publicly available due to confidentiality reasons.

For the air transportation industry in 2000 GDP impacts were zero and continually increased, reaching a peak in 2003 of $84 thousand declining to $45 thousand in 2004 but increasing in incremental amounts to $69 thousand in 2005 and $103 thousand in 2006. In 2007 the GDP impacts increase dramatically to over $650 thousand, declining slightly in 2008 and then increasing again by a large amount in 2009, reaching over $1.5 million in GDP impacts.

In the support for transportation industries the impacts in 2000 reach over $7 thousand but then decrease to zero in 2001. Smaller impacts occurred in 2002 with only $1 thousand and no impacts occurred in 2003. In 2004 the GDP impacts were $3 thousand and zero again in 2005. In 2006 the GDP impacts were 3 thousand and more than double in 2007 reaching over $7 thousand. The GDP impacts remain steady in 2008 then increasing in 2009 reaching $9 thousand.

The greatest GDP impact in the territorial traveller accommodation industries occurs in 2001 with $305 thousand in impacts occurring. In 2000 the impacts were only $77 thousand as well as impacts range from $83 thousand in 2003 to $142 thousand in 2005 never reaching the levels seen in 2001 until 2007. In 2007 GDP impacts in the amount of $248 thousand were incurred by the territorial traveller accommodation activities further increasing to $304 and $298 thousand in 2008 and 2009 respectively.

Figure 7.4 clearly shows that the greatest GDP impacts occurred between 2007 and 2009 with the greatest impacts occurring in the territorial professional, scientific and technical industries. Before 2007 GDP impacts greater than $250 thousand were never experienced in the territorial due to northern research. Between 2007 and 2009 the GDP impacts doubled for almost every industry and even quadrupled in professional, scientific and technical service industries.

7.1.3 Total Income Impacts

Table 7.4 shows the direct and total (direct plus indirect) income impacts. The income impact is the impact of publicly funded northern research expenditures on the wages and salaries of the people living in the Canadian Territories. The income impact shown for each industry is found by multiplying the final demand increase in each territory each year by the Statistics Canada 'wages and salaries' multiplier, the values for each territory are then added together to estimate total income impacts for Canadian Territories, breakdown by activity (Table 7.4). Looking at Table 7.1 the Northwest Territories direct and total wages and salaries multipliers are 0.44 and 0.49 for the professional, scientific, technical industry in 2007. The multiplier is less than one because the multiplier is obtained by weighting the contribution of each industry by the ratio of wages and salaries-to-output. It is also less than GDP multiplier because income is a portion of the GDP.

In 2007 the northern expenditures in the Northwest Territories was $338 thousand. In Table 7.1 the direct wages and salaries multiplier for the professional, scientific, technical industry is 0.44 in 2007. The northern expenditure (i.e. final demand shocks) for this industry in the Northwest Territories is multiplied by this multiplier to obtain the direct income impact for this industry. Similarly, the total income impact for the Northwest Territories was found by multiplying the final demand shock by the total wages and salaries multiplier of 0.49 to find the total income impact for that territory. The direct and total income impacts for Nunavut and the Yukon were then found using the same steps. Finally, the impacts for all three territories were added together to form Figure 7.5 and Table 7.4. The multipliers for each territory are found in Appendix C.

Examining the total income impacts in Table 7.4, it shows the total income impacts range from $199 thousand in 2000 to $526 thousand in 2006. The income impact increases

dramatically in 2007, reaching a peak in 2007 of $2.6 million. In 2008 the income impact remains steady but declines to $1.6 million in 2009. In order to compare the income impact of northern research on the territorial economy during 2007 the average salary of a northern resident residing in the territory ($49,785.73[16]) was multiplied by the total employed (55,711[17]) to obtain the total average earnings per year ($2,773 million). The income generated by northern research ($2.6 million) was then compared to the total average earnings. Thus estimating that in 2007, publicly funded research accounted for only 0.09% of the total wages and salaries in the territorial economy.

Figure 7.5 below shows that the largest impacts were felt by the other professional, scientific, technical service industries. It was found that the direct impacts incurred by the university industry did not result in any GDP impacts and the support services for transport industry experienced very minimal impacts, therefore universities and support for transport industries are not included in Figure 7.5.

Below the income impacts for each impacted industry are examined. The greatest impacts for the other professional, scientific, technical service industries occurred in 2007 when impacts reached over $1.8 million and contributed the greatest to the total income impacts in that year (71%). Before 2007 impacts never reached above $228 thousand. However in 2009 income impacts decreased dramatically to under $450 thousand. The indirect impacts averaged 12% of the total between 2000 and 2009.

[16] Statistics Canada Table 281-0027
[17] Statistics Canada Table 281-0024

Table 7.4: Total income impacts for Canadian Territories, Breakdown by Activity 2000-2009 (Thousands, $)

		Income Impacts (Thousands, $)								
		Univer-sities	Other Professional/ Scientific/ Technical Services	Other Admin/ Support Services	All other Transit and Ground Passenger	Air Transport	Support Activities for Transport	Traveller Accommodation	Food Services and Drinking Places	Total
2000	Direct	0	89	0	2	x	x	x	33	0
	Total	0	105	0	4	0	4	45	41	199
2001	Direct	0	67	15	39	x	x	x	2	0
	Total	0	80	16	50	28	0	172	3	349
2002	Direct	0	70	5	54	x	x	x	16	0
	Total	0	80	6	64	28	0	69	18	265
2003	Direct	0	151	5	45	x	x	x	7	0
	Total	0	175	5	53	60	0	48	8	349
2004	Direct	0	71	8	16	x	x	x	35	0
	Total	0	82	9	18	33	2	60	41	244
2005	Direct	0	70	41	48	x	x	x	37	0
	Total	0	79	46	53	37	0	83	43	341
2006	Direct	0	190	54	15	x	x	x	72	0
	Total	0	228	60	17	54	2	72	94	526
2007	Direct	0	1,653	58	48	x	x	x	94	0
	Total	0	1,866	62	53	383	4	142	107	2,618
2008	Direct	0	1,665	49	41	x	x	x	112	0
	Total	0	1,691	50	45	344	4	175	129	2,438
2009	Direct	0	378	31	43	x	x	x	100	0
	Total	0	426	32	48	893	5	171	114	1,689
Sum of Total Impacts		0	4,810	285	406	1,861	21	1,037	597	9,017

x - multipliers were not available due to confidentiality reasons

For the other administrative and support service industries income impacts were minimal peaking at $62 thousand in 2007. In 2000 income impacts were zero but averaged under $10 thousand from 2001 to 2004. From 2005 to 2009 impacts averaged $50 thousand. On average indirect impacts for the other administrative and support service industries was 7% of the total.

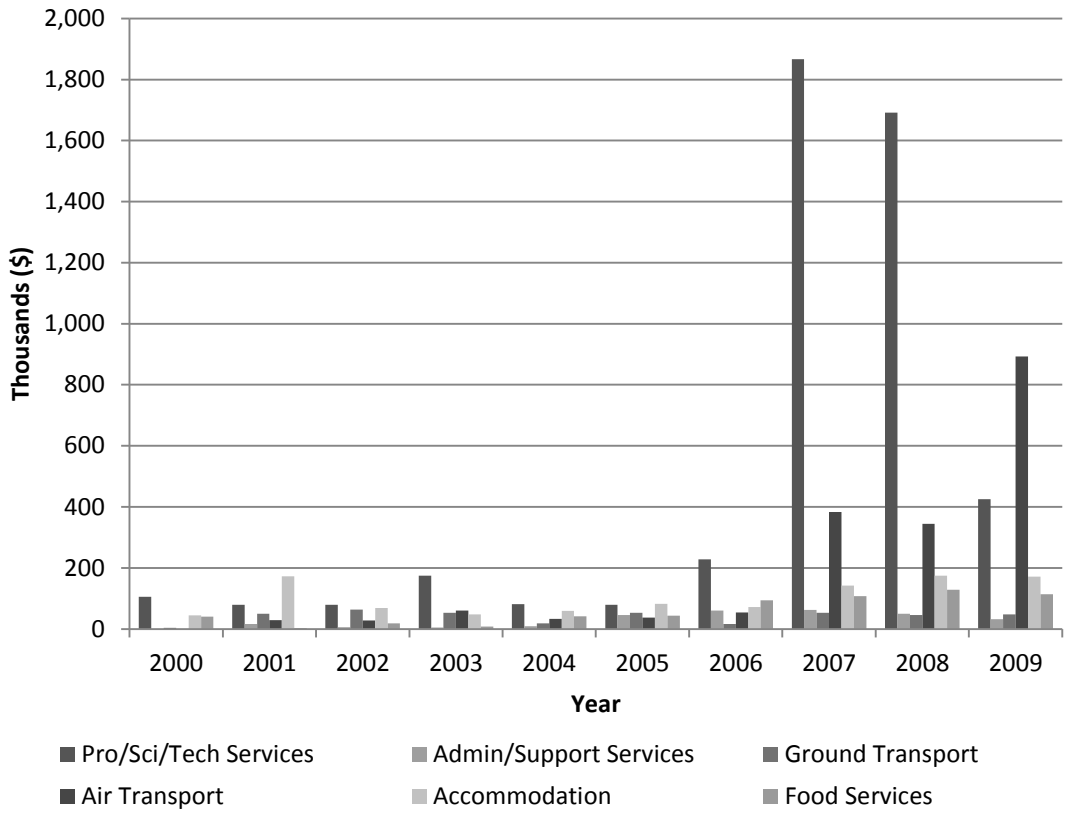

Figure 7.5: Total income impacts for Canadian Territories (Thousands, $)

For transit and ground passenger transportation the impacts on wages and salaries average around $50 thousand. However, in 2000 impacts were very minimal, under $4 thousand. The results were also minimal in 2004 and 2006 with income impacts at approximately $18 thousand. The largest income impact occurred in 2002 for the transit and ground passenger transportation industry with $64 thousand. Indirect income impacts were on average 16% of the total.

In 2000, the food services and drinking place industries experienced just over $40 thousand in income impacts but decreases dramatically in 2001 to 3 thousand. In 2002 the impacts increase to $18 thousand but decreases in 2003. In 2004 a large increase in income impacts occurred totalling over $40 thousand in both 2004 and 2005. A large increase occurs again in 2006 when income impacts reach over $90 thousand. Incremental increases are seen in 2007 and 2008 reaching $129 thousand. In 2009 the income impacts decrease slightly with approximately $114 thousand. The proportion of indirect impacts is on average 15% of the total.

The following section deals with the total direct plus indirect impacts occurred by air transport, support activities for transport and traveller accommodation industries. Direct income impacts could not be found for these industries as the direct income multipliers are not publicly available from Statistics Canada due to confidentiality reasons.

In 2000 income impacts in the air transportation industry was zero and continually increased, reaching a $60 thousand in 2003 then declining to $33 thousand in 2004 but increasing in incremental amounts to $37 thousand in 2005 and $54 thousand in 2006. In 2007 the income impacts increase dramatically to $383 thousand, declining slightly in 2008 and then increasing again by a large amount in 2009, reaching $893 thousand in income impacts.

In 2000, the impacts on wages and salaries reach approximately $4 thousand but are zero in 2001, 2002, 2003 and 2005. In 2004 income impacts were approximately $1.5 thousand. In 2007 and 2008 the income impacts increase substantial reaching $4 thousand and increase again in 2009 reaching $5 thousand.

The greatest income impacts in the territorial traveller accommodation industries occur in 2001 with $172 thousand in impacts. In 2000 the impacts were only $45 thousand as well as impacts range from $69 thousand in 2002 to $72 thousand in 2006. The impacts increase in from 2007 to 2009 reaching a peak in 2008 of $175 thousand but decreasing in 2009 to $171 thousand.

Figure 7.5 shows that the greatest income impacts occurred between 2007 and 2009 with the greatest impacts occurring in the territorial professional, scientific and technical industries. Before 2006 the total income impacts never got larger than $350 thousand but in 2007 impacts on wages and salaries totalled $2.6 million.

7.1.4 Total Employment Impacts

Table 7.5 shows the total employment impacts. This is represented by the direct and indirect impacts of northern research on the number of jobs created per million dollars of final demand change. The direct and total (direct plus indirect) values show the respective impacts based on the Statistics Canada 'number of jobs' multiplier. The number of jobs multiplier includes the number of full-time, part-time and/or temporary jobs created, not the total hours worked per employee. It includes employee and self-employed jobs[18]. The employment impact

[18] The self-employed jobs include people who work in a family business but do not get paid.

shown for each industry is found by multiplying the final demand increase in each territory each year by the Statistics Canada 'number of jobs' multiplier, the values for each territory are then added together to form Table 7.5. Looking at Table 7.1 the Northwest Territories direct and total number of jobs multipliers are 11.25 and 12.13 for the professional, scientific, technical industry in 2007.

In 2007 the northern expenditures in the Northwest Territories was $338 thousand. This value was converted to $0.338 million. In Table 7.1 the direct number of jobs multiplier for the professional, scientific, technical industry is 11.25 in 2007. The northern expenditure (i.e. final demand shocks) in millions of dollars (i.e. $0.338) for this industry in the Northwest Territories is multiplied by the employment multiplier (11.25) to obtain the direct employment impact for this industry. Similarly, the total income impact for the Northwest Territories was found by multiplying the same final demand shock in millions of dollars by the total wages and salaries multiplier of 12.13 to find the total income impact for that territory. The direct and total employment impacts for Nunavut and the Yukon were then found using the same steps. Finally, the impacts for all three territories were added together to form Figure 7.6 and Table 7.5. The multipliers for each territory are found in Appendix C.

Examining the total employment impacts in Table 7.5, the sum of the total employment impacts in 2000 was 18 jobs. This declines in 2001 and 2002 to only 13 and 9 jobs respectively. In 2003 the number of jobs increased to just 10 jobs but then decreases to the lowest amount in 2004 to only 7 people. The number of jobs in 2005 and 2006 doubles creating 13 and 14 jobs in total. Based on the other results, as expected these numbers are insignificant compared to the number of jobs created in 2007 and 2008 which was 61 and 62 respectively. However the number of jobs declined in 2009 with 38 jobs created. In 2008, the total number employed in the territories was approximately 56,982 and in 2007 employment was at 55,711[19]. This means that in 2007 and 2008 the jobs created by publicly funded research accounted for only 0.11% of the total.

As expected the greatest number of jobs was created in the other professional, scientific, technical service industries and the smallest number of jobs occurred in the other administration and support service industries. It was found that the direct impacts incurred by the university

[19] Employment statistics obtained from Statistics Canada Table 281-0024

industry did not result in any employment impacts and the support services for transport industry experienced very minimal impacts, therefore these industries are not included in Figure 7.6.

Below the employment impacts for each impacted industry are examined. Similar to the output, GDP and income impacts, the other professional, scientific, and technical service industries in the territories experienced the largest increase in employment due to northern research. In the year 2000, 13 jobs in the territories were created in this sector due to northern research. However the number of jobs created decreases drastically from 2001 to 2006 averaging 3.5 people. In 2007 and 2008 the number of jobs increased drastically to approximately 44. However, in 2009 the number of jobs decreased to just over 10. Also, the proportion of the indirect to direct jobs averaged around 12% over the time period examined.

For the other administrative and support service industries employment impacts were zero from 2000 to 2004. In 2005 the number of jobs peaked at 2 people, from 2006 to 2009 the number of jobs decline to 1. On average the number of indirect jobs created was 8% of the total.

In the years 2000 and 2006 the number of jobs created in the territorial transit and ground passenger transportation industries was zero. One job was created in 2001 increasing to 2 in 2002 and then decreasing back to 1 from 2003 to 2005. The number of jobs created in the territorial transit and ground passenger transportation industries from 2007 to 2009 increased to 2. On average the number of indirect jobs created was 16% of the total.

Table 7.5: Direct and Total Employment Impacts for Canadian Territories, Breakdown by Activity 2000-2009

		Employment Impact								
		Univer-sities	Other Professional/ Scientific/ Technical Services	Other Admin/ Support Services	All other Transit and Ground Passenger	Air Transport	Support Activities for Transport	Traveller Accomm odation	Food Services and Drinking Places	Total
2000	Direct	0	13	0	0	x	x	x	2	
	Total	0	13	0	0	0	0	2	3	18
2001	Direct	0	3	0	1	x	x	x	0	
	Total	0	3	0	1	1	0	7	0	13
2002	Direct	0	2	0	1	x	x	x	1	
	Total	0	2	0	2	1	0	3	1	9
2003	Direct	0	4	0	1	x	x	x	0	
	Total	0	5	0	1	1	0	2	0	10
2004	Direct	0	1	0	1	x	x	x	2	
	Total	0	1	0	1	1	0	2	2	7
2005	Direct	0	3	2	1	x	x	x	2	
	Total	0	3	2	1	0	0	4	3	13
2006	Direct	0	5	1	0	x	x	x	3	
	Total	0	6	1	0	1	0	2	4	14
2007	Direct	0	40	1	2	x	x	x	4	
	Total	0	44	1	2	6	0	3	4	61
2008	Direct	0	40	1	2	x	x	x	5	
	Total	0	44	1	2	6	0	5	5	62
2009	Direct	0	9	1	2	x	x	x	4	
	Total	0	10	1	2	16	0	5	4	38
Sum of Total Impacts		0	132	7	12	33	0	35	26	245

x - multipliers were not available due to confidentiality reasons

In the territorial food services and drinking places industries zero jobs were created in 2001 and 2003. In 2000, 2004 and 2005 the number of jobs was approximately 3 but in the year 2002 the number was 1. The largest number of jobs in the territorial food services and drinking places industries occurred in 2008 totalling 5 jobs and only decreases slightly in 2009 to 4. On average the proportion of indirect to direct jobs and 8% in each year.

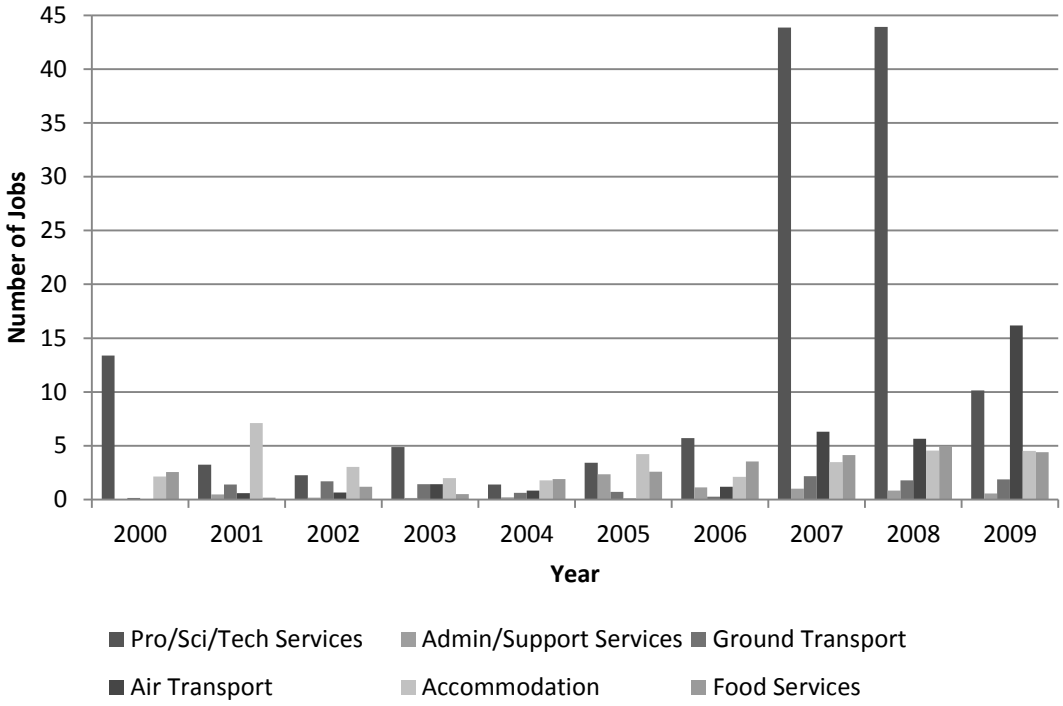

Figure 7.6: Total employment impacts for Canadian Territories (# of jobs)

The following section deals with the indirect employment impacts occurred by air transport, support activities for transport and traveller accommodation industries. As mentioned previously direct employment impacts could not be found for these industries as the direct employment multipliers are not publicly available from Statistics Canada because they are suppressed to meet the confidentiality requirements of the Statistics Act (Statistics Canada, 2007).

In 2000 for the air transport industry zero employment impacts were generated in the territories. From 2001 to 2006 the number of jobs created is one each year. In 2007 and 2008 the number of total number of jobs increased to 6 people but increased dramatically in 2009 with the number of jobs at 16. The support activities for transportation generated less than one job each year. Many times the employment impact was zero.

In the territorial traveller accommodation industries the employment impact varied between 2 and 7 jobs. However the largest amount of jobs did not occur in 2007 like the other industries but rather in 2001. For all other years the number of jobs created averaged between 2 and 4 with 2 occurring in earlier years and 5 in the latter.

Figure 7.5 shows that the greatest income impacts occurred between 2007 and 2009. However, like the other impacts, the greatest impacts typically occurred in the territorial professional, scientific and technical industries but in 2009 the greatest employment impact occurred in the air transport industry. Before 2006 the total employment impacts never got larger than 15 people but in 2007 impacts on employment reached over 40 jobs in the professional, scientific and technical industry.

7.2 Comparison of Total Public Research and Other Industry Impacts

Table 7.7 compares the 2007 GDP, Income and Employment Impacts of publicly funded northern research to the total impact of similar size final demand changes in other northern sectors. The other industries chosen include: mining, oil and gas; construction; arts, entertainment and recreation; and commercial fishing, hunting and trapping. The year 2007 was chosen as a comparison because this is the year in which the greatest impacts occurred due to northern research in the territories and this was the last year in which multipliers were made publicly available from Statistics Canada. In Table 7.7 the value of the impacts for these other industries was obtained by:

1) Hypothetically increasing each industry's final demand by the same amount as the increase in final demand experienced in each territory due to northern research. In 2007 the Yukon expenditures totalled $666,570.51, Northwest Territories $ 2,416,605.51 and Nunavut $2,491,276.37;
2) Multiplying the same direct requirement expenditures by the corresponding output, GDP, income and employment multipliers for the mining, oil and gas; construction; arts, entertainment and recreation; and commercial fishing, hunting and trapping industries. The multipliers are shown in Table 7.6; and
3) Adding the results for each territory together to obtain the territorial totals for each industry, shown in Table 7.7.

Since the final demand was increased for each industry by the same amount as the final demand increase in the territories due to publicly funded northern research, the impact of publicly funded northern research can be compared to the impact other northern industries would incur if they experienced the same impact.

Table 7.6: Total (Direct plus Indirect) Multipliers for Each Canadian Territory, Breakdown by Activity 2007

Total (direct plus indirect) Multipliers, 2007					
		Mining and Oil and Gas Extraction	Construction	Arts, Entertainment and Recreation	Commerical Fishing, Hunting and Trapping
Output Total	Yukon	1.10	1.24	1.28	1.19
	NWT	1.16	1.21	1.34	1.48
	NT	1.09	1.12	1.27	1.50
GDP	Yukon	0.80	0.45	0.61	0.28
	NWT	0.71	0.46	0.57	0.53
	NT	0.58	0.34	0.59	0.64
Income (wages and salaries)	Yukon	0.15	0.19	0.36	0.07
	NWT	0.13	0.29	0.35	0.33
	NT	0.54	0.13	0.36	0.62
Employment (# of jobs/million)	Yukon	3.06	3.91	20.19	11.68
	NWT	1.26	3.77	13.75	14.85
	NT	5.90	2.20	66.52	10.87

Table 7.7 shows that the total (direct plus indirect) output impacts of northern research on the territorial economy due to northern research expenditures in 2007 was approximately $6.8 million. The total output impact of northern research was 9% larger than the hypothetical impact of the mining, oil and gas extraction industry and 4% more than they hypothetical impact experienced by the construction industry in the northern territories. However, the total output impact of northern research was 7% less than the hypothetical total output impact in the arts, entertainment and recreation sector and 17% less than the hypothetical total output impact in the commercial fishing, hunting and trapping industry. The output impact is greater in the arts, entertainment and recreation industry and commercial fishing, hunting and trapping industry because of the fact that they make more purchases locally than the mining or construction industries. This is expected as Table 7.6 shows that in all cases the output multipliers for the mining and construction industries are smaller than the arts and fishing industries. This means that the indirect effects, i.e. spending and re-spending in the local economy, are greater in the arts and fishing industries.

Table 7.7: Total Economic Impacts for Canadian Territories, Breakdown by Activity 2007 (Thousands, $)

	Northern Research	Mining and Oil and Gas Extraction	Construction	Arts, Entertainment and Recreation	Commerical Fishing, Hunting and Trapping
Output	6,799.13	6,251.98	6,540.87	7,255.38	8,106.71
GDP	3,168.86	3,693.99	2,258.63	3,253.93	3,061.86
Income	2,618.12	1,759.43	1,151.33	1,982.64	2,388.73
Employment (# of jobs)	61.03	6.83	6.59	67.19	24.97

Table 7.7 shows that the total (direct plus indirect) GDP impact of northern research on the territorial economy due to northern research expenditures in 2007 was approximately $3.2 million due to the new final demand expenditures. The total GDP impact of northern research would be similar to all the other industries compared in Table 7.7 except in the construction industry where the GDP impact of northern research would be 29% greater. Since GDP represents the sum of the wages and salaries as well as the corporate profit Table 7.7 suggests that most construction companies are not located in the territories and therefore less wages, salaries and corporate profits stay in the local economy compared to the other industries.

Table 7.7 shows that the total (direct plus indirect) income (wages and salaries) impact of northern research on the territorial economy due to northern research expenditures in 2007 was approximately $2.6 million due to the new final demand expenditures of $5.4 million. By hypothetically increasing the final demand by the same $5.4 million the income impact for the mining, oil and gas extraction; construction; arts, entertainment and recreation; and fishing, hunting and trapping industries were 33%, 57%, 26% and 9% less than the impact created by northern research. This implies that the local income generated by northern research would be comparable to commercial hunting, fishing and trapping industry. This is because the activities of northern researchers in the territories are similar to that of tourists participating in the commercial hunting, fishing and trapping industry. Both hire local people as guides or experts, stay in local accommodations and buy food from the local restaurants, thus generating similar income impacts.

The $5.4 million of new final demand created by northern research created approximately 61 jobs in 2007. By hypothetically increasing the final demand by the same $5.4 million, the

mining, oil and gas sector; construction; and commercial fishing and hunting industries only experienced a creation of 6.81, 6.59 and 24.93 jobs respectively. However, the arts, entertainment and recreation would have experienced the creation of 67.19 jobs due to a change in final demand of $5.4 million. The low employment impacts in the mining, oil and gas sector as well as the construction industry is due to the fact that these industries are more capital intensive than the other industries. For example, if the final demand in the mining sector increased drastically more machinery would be needed to meet that demand than people. While most arts and crafts are labour intensive rather than capital intensive if demand increased for arts and crafts more people be would be needed to make the arts and crafts necessary to meet the increase in demand.

7.3 Chapter Summary

It was shown that the territorial economic contribution of publicly funded northern research expenditures grew from $591 thousand in 2000 to just under $5 million in 2009. Interestingly, of the total contributions, 65% occurred between 2007 and 2009. Thus the results show that in recent years the publicly funded northern research sector has grown considerably. During the ten year period, on average the industries experiencing the greatest contributions from public research were the other professional, scientific and technical service industry with 32% of the output impacts and the air transport industries also with 32% of the output impacts.

Although the public research sector has grown considerably in the territories it was estimated that in 2007 northern research expenditure impacts represented only 0.04% of GDP, 0.09% of total aggregate income and 0.11% of total employment. Thus by examining the impacts of publicly funded northern research expenditures on a territorial level it appears that the impacts are minimal. However, a majority of these research projects involve the participation of residents in smaller communities where employment opportunities are often very limited. Since a majority of the research dollars are spent in these smaller communities northern research expenditures do potentially represent an important source of local income and employment. These funds in turn are spent and re-spent locally and can also support other economic pursuits in the land based subsistence economy. For example, funds gained through research can be used to purchase necessary supplies and equipment to faciliate the harvesting of wildfoods.

Comparing the results of the territorial impacts in 2007 of publicly funded northern research with hypothetical impacts generated by identical expenditure increases in the following sectors: commercial fishing, hunting and trapping; arts, entertainment and recreation; mining, oil and gas extraction; and construction industries. The comparisons revealed that output (sales) impacts were similar among all industries examined, although commercial fishing, hunting and trapping experienced the greatest impact on output.

GDP impacts were also similar among all industries except mining, oil and gas extraction which showed a greater impact. Starting with a final demand increase in this industry leads to substantial GDP impact. In terms of gross spending, however, the impacts would be relatively small as a very high proportion of expenditures would go to factors of production outside the territories.

The income impacts were similar between northern research expenditures and the commercial fishing, hunting and trapping industries, although northern research had the greater impact. This implies that the wages and salaries generated by a certain dollar value of northern research expenditure are comparable to those that would be generated in the commercial fishing, hunting and trapping industry. However, the hypothetical employment impacts for the commercial fishing, hunting and trapping industries are considerably lower. This implies that a particular $ expenditure leads to more employment if the spending category is northern research expenditures, likely because this is a relatively labour-intensive enterprise. Commercial fishing would be more capital intensive, thus the same $ expenditure increase translates into fewer jobs.

When comparing the different industries it was found that the greatest employment impacts for identical increases in final demand expenditures were experienced by the arts, entertainment and recreation industry although employment impacts of public research were comparable. This is because both industries involve the participation of people from various similar industries in order to produce a product. Also, arts and research are both labour intensive industries thus when similar demand increases are experienced more jobs are created than when an industry is more capital intensive.

CHAPTER 8: CONCLUSIONS

The purpose of this study was to not only disprove the hypothesis that "northern research will not have a measureable impact on the territorial economy" but also estimate the impact of northern research expenditures on the territorial economies. This was done by determining the economic contribution and importance of publicly funded northern research in the Canadian territories between the years 2000-2009. Completing this task required determining the economic impact of northern research for the Canadian territories and comparing the impact to other territorial industries.

8.1 Summary of Study

Between the years 2000 and 2009, publicly funded northern research contributed over $25 million in total (direct plus indirect) output impacts within the territorial economies. The local activities associated with publicly funded northern research include funding graduate students and assistants, travelling and staying in the north to conduct field studies and buying equipment. The expenditures were broken down into northern and southern expenditures. The northern expenditures were further broken down into eight Statistics Canada input-output industry headings:

1) Universities, representing graduate student salaries;
2) Other professional, scientific and technical services and
3) Other administrative and support services, representing payments for this particular kind of assistance;
4) Other passenger and ground transportation services, representing vehicle rentals;
5) Air transportation, representing all air travel including commercial, small aircraft and helicopter;
6) Support for transportation includes purchase of gasoline;
7) Traveller accommodation represents all accommodation costs; and
8) Food services and drinking places represents the money spent on food and incidentals.

No past studies have been conducted on the economic contribution of publicly funded northern research expenditures within the Canadian territories. To evaluate the economic impacts for a region, the method chosen for this study was the use of Statistics Canada input-output multipliers. The method was chosen because detailed information regarding specific impacts of publicly funded research could easily be found based on the given data and available resources. To analyze the impact of publicly funded research on the Canadian territories, multipliers created by Statistics Canada were multiplied by the northern expenditures found for each territory and each activity for every year. The northern expenditures were treated as increases in final demand. The values obtained for each territory were then added together to give the total direct and direct plus indirect impact.

The data was initially collected from the budget justification provided by SSHRC, NSERC, CIHR, SCI, NEI and PCSP. From websites and annual reports additional northern research expenditure data was obtained for other publicly funded northern research agencies. The conclusions and implications as determined by the input-output multipliers are described below.

8.2 Conclusions and Implications

Through this research it was determined that territorial publicly funded northern research expenditures has increased substantially causing millions of dollars in economic impacts within the territories. Although the public research sector has grown considerably in the territories it was estimated that during 2007 northern research expenditures accounted for only 0.04% of GDP, 0.09% of total aggregate income, and 0.11% of total territorial employment. Thus by examining the impacts of publicly funded northern research on a territorial level it appears that the economic contribution is minimal.

While the total economic contribution of publicly funded research is small relative to other economic sectors at the territorial level, more significant impacts may be realized within communities. For example, the money spent locally on lodging, subsistence, the hiring research assistants, paying for translation services, providing compensation for research involvement, and other associated costs may be large, relative to the local economies, where wage earning or

revenue generating opportunities are very limited. Funds that are spent and respent locally could therefore represent an important addition to the local economy.

Given the seasonal nature of most northern research, those community members who are directly involved as research assistants or providing other forms of expertise can also pursue other forms of employment during other times of the year. This might involve participation in the land based economy where funds gained through research can be used to faciliate the harvesting of wildfoods (i.e., purchase necessary supplies and equipment) or may be distributed within community networks thereby allowing others to harvest country foods which are then redistributed locally. Used in this way research revenues have an imporyant multiplier effect locally as well as import substitution value when considering the health benefits associated with the harvesting of country foods.

Local involvement in research may also have other intangible benefits for community members. For instance by engaging with university researchers communities develop important proesssional networks that can be employed to address local issues of concern (Wolfe et al., 2011). Local engagement in research can also help develop research capacity where communities gain the necessary experience to direct research on their own or with the support of university researchers (Wesche et al., 2011). This may then lead to other forms of local empowerment not readily discerned through economic analysis (Wilmsen et al., 2008), for instance the pursuit of post-secondary education among youth who have been exposed to northern research.

With increased research attention on the north there is a growing sense of 'research fatigue' among many northern communities. As a result the northern research institutes (Nunavut Research Institute, Aurora Research Institute, and Yukon Research Centre) are being called upon to articulate the tangible benefits that communities gain from participating in research. It is hoped that this research will assist the northern research institutes by providing the first economic evaluation of northern research. Through this research an evaluative framework has also been developed that will enable the northern research institutes to monitor and assess the economic benefits of northern research at the territorial levels in the future.

REFERENCES

Aboriginal Affairs and Northern Development Canada (AANDC), 2009. Arctic Research Infrastructure Fund. http://www.ainc-inac.gc.ca/nth/st/arf-eng.asp

Aboriginal Affairs and Northern Development Canada (AANDC), 2010. Northern Contaminants Program. http://www.aadnc-aandc.gc.ca/eng/1100100035611

Aboriginal Affairs and Northern Development Canada (AANDC), 2011. Backgrounder - Arctic Research Infrastructure Fund: Project Descriptions - Indian and Northern Affairs Canada. http://www.aadnc-aandc.gc.ca/aiarch/mr/nr/j-a2009/bk000000260-eng.asp

ArcticNet, 2011. ArcticNet - a Network of Centres of Excellence of Canada. http://www.arcticnet.ulaval.ca/

Barber-Dueck, C., Kotsovos, D., 2003. The provincial and territorial tourism satellite accounts for Canada, 1996. Statistics Canada. Income and Expenditure Accounts Division.

Bezdek, R.H., 1984. Tests of Three Hypotheses Relating to the Leontief Input-Output Model. Journal of the Royal Statistical Society. Series A (General) 147, 499–509.

Canadian Institute of Health Research (CIHR), 2011. Our Mission. http://www.cihr-irsc.gc.ca/e/7263.html

CBC News, 2011. Mining exploration boom creates Yukon jobs. http://www.cbc.ca/news/canada/north/story/2011/08/01/yukon-exploration-boom.html

Conference Board of Canada, 2010. Northern Outlook.

Encyclopedia of Canadian Provinces., 2007. Encyclopedia of Canadian Provinces. http://www.nationsencyclopedia.com/canada/

Environment Canada, 2008. Northern Ecosystem Initiative: Building Capacity and Delivering Results Environment Canada's Contributions to the Northern Environmental Agenda.

Frampton, P., 2009. Look Up Nunavut. http://www.lookupnunavut.ca/oil.html

Gilchrist, D.A., St. Louis, L.V., 1991. Directions for Diversification with an Application to Saskatchewan. Journal of Regional Science 31, 273–289.

Gilchrist, D.A., St. Louis, L.V., 1994. An equilibrium analysis of regional industrial diversification. Regional Science and Urban Economics 24, 115–133.

Gilchrist, D.A., St.Louis, L.V., 2001. An equilibrium analysis of the diversification of regional agriculture. Environment and Planning A 33, 11–26.

Goldstein, H.A., 1989. Estimating the Regional Economic Impact of Universities: An application of Input-Output Analysis. Planning for Higher Education 18, 51–64.

Government of Yukon, 2010. Economic Sectors. http://www.gov.yk.ca/aboutyukon/industry.html

Griliches, Z., 1995. R&D and productivity. In: Stoneman, P. (Ed.), Handbook of Industrial Innovation., in: Blackwell, London. pp. 52–89.

Human Resources and Skills Development Canada (HRSDC), 2006. Canadians in Context - Aboriginal Population / Indicators of Well-being in Canada. http://www4.hrsdc.gc.ca/.3ndic.1t.4r@-eng.jsp?iid=36

Industry Accounts Division, S. of N.A., 2009. User's Guide to the Canadian Input-Output Model.

International Polar Year (IPY), 2007. Frequently Asked Questions. http://www.ipy-api.gc.ca/pg_IPYAPI_008-eng.html#q1.1

Inuit Tapiriit Kanatami (ITK) and Nunavut Research Institute (NRI), 2007. Negotiating Research Relationships with Inuit communities: A Guide for Researchers.

Kisquared, 2006. Economic Impact Assessment of the Yukon Music Industry. Music Yukon.

Lal, K., 1982. Compilation of Input-Output Tables: Canada.

Martin, B., Salter, A., Hicks, D., Pavitt, K., Senker, J., Sharp, M., Von Tunzelmann, N., 1996. The Relationship Between Publicly Funded Basic Research and Economic Performance: A SPRU Review.

McConnell, C.R., Brue, S.L., Barbiero, T.P., 2005. Macroeconomics, 10th Canadian ed. McGraw-Hill Ryerson Limited.

Miller, F.C., 1984. The Impact of Dree Grants on Employment in the Atlantic Provinces: An Input-output Analysis. The Canadian Journal of Regional Science/La Revue Canadienne des Sciences Regionales VII, 77–93.

Miller, R., Blair, P., 1985. Input-Output Analysis, Foundations and Extensions. Prentice-Hall Inc., Englewood Cliffs, New Jersey.

Murty, K., 2004. Government Production Technologies in Canada: 1961 to 2000. Economic Systems Research 16, 413–433.

Natural Resources Canada (NRCan), 2005. Canada's Sustainable Communities Initiative.

Natural Resources Canada (NRCan), 2010. Polar Continental Shelf Program. http://polaire.rncan.gc.ca/about/index_e.php

Natural Sciences and Engineering Research Council (NSERC), 2009. NSERC - Chronicle of Past Events. http://www.nserc-crsng.gc.ca/NSERC-CRSNG/History-Historique/chronicle-chronique_eng.asp#today

Nunavut Bureau of Statistics, 2011. Nunavut population estimates by region and community, 1996-2010.

Nunavut Department of Economic Development and Transportation, 2008. Nunavut Visitor Exit Survey, 2008 Final Report.

Nunavut Economic Forum, 2010. Nunavut Economic Outlook.

NWT Industry, Tourism and Investment, 2011a. Northwest Territory Economic Review and Outlook.

NWT Industry, Tourism and Investment, 2011b. Tourism & Parks. http://www.iti.gov.nt.ca/tourismparks/

Poole, E., 1995. A Concise Description of Statistics Canada's Input-Output Models. Canadian Journal of Regional Science/Revue canadienne des sciences regionales XVIII, 255270.

Romer, P.M., 1990. Endogenous technological change. Journal of Political Economy 98, 571–S102.

Salter, A.J., Martin, B.R., 2001. The economic benefits of publicly funded basic research: a critical review. Research policy 30, 509–532.

Social Sciences and Humanities Research Council (SSHRC), 2011. SSHRC - About SSHRC. http://www.sshrc-crsh.gc.ca/about-au_sujet/index-eng.aspx

Stabler, J.C., St. Louis, L.V., 1988. Saskatchewan Steel: A Regional Industrial Impact Analysis XI, 133–145.

Statistics Canada, 1989. A User Guide to the Canadian System of National Accounts.

Statistics Canada, 2007. The Input-Output Structure of the Canadian Economy.

Statistics Canada, 2010. The Input-Output Structure of the Canadian Economy 2006/2007.

Statistics Canada, 2011. Table 051-0001, Estimates of population by age group and sex, Canada, provinces and territories.

Statistics Canada, 2010. Table 384-0002, Gross domestic product (GDP), expenditure-based, provincial economic accounts.

Statistics Canada, 2011. Table 281-0027, Average weekly earnings (SEPH), by type of employee for selected industries classified using the North American Industry Classification System (NAICS).

Statistics Canada, 2011. Table 281-0024, Employment (SEPH), unadjusted for seasonal variation, by type of employee for selected industries classified using the North American Industry Classification System (NAICS)

Statistics Canada, S. of N.A., 2001. A Guide to Deflating the Input-Output Accounts: Sources and methods.

Task Force on Northern Research, 2000. From Crisis to Opportunity: Rebuilding Canada's Role in Northern Research. A Final Report to NSERC and SSHRC.

Thomassin, P.J., Henning, J.C., Baker, L., 1992. Macroeconomic Impacts of an Agro-Ethanol Industry in Canada. Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie 40, 295–310.

Turner, Rhonda, 2010. Northern Scientific Training Program - Transcript. http://www.ainc-inac.gc.ca/nth/st/nstp/vdo/nstptrnscrpt-eng.asp

Wesche, S., Schuster, R., Tobin, P., Dickson, C., Matthiessen, D., Graupe, S., Williams, M., Chan, H., 2011. Community-based health research led by the Vuntut Gwitchin First Nation. International Journal of Circumpolar Health 70, 45–63.

Wilmsen, C., Elmendorf, W., Fisher, L., Ross, J., Sarathy, B., Wells, G., 2008. Partnerships for Empowerment: Participatory Research for Community-Based Natural Resource Management.

Wolfe, B., Humphries, M., Pisaric, M., Balasubramaniam, A., Burn, C., Chan, L., Cooley, D., Froese, D., Graupe, S., Hall, R., Lantz, T., Porter, T., Roy-Leveillee, P., Turner, K., Wesche, S., Williams, M., 2011. Environmental Change and Traditional Use of the Old Crow Flats in Northern Canada: An IPY Opportunity to Meet the Challenges of the New Northern Research Paradigm. Arctic 64, 127–135.

Wolfe, D., 1996. The emergence of the region state. In: Courchene,T.J., The Nation State in a Global / Information Era: Policy Challenges. John Deutsch Institute for the Study of Economic Policy, Queen's University, Kingston, Ontario, pp. 205–240.

Yukon Economic Development, 2011. Yukon Economic Outlook.

Yukon Economic Development Film & Sound Commission, 2010. Yukon Film & Sound Incentive Program Annual Report.

Ziad, G., 2010. The Canadian and Inter-Provincial Input-Output Models: The Mathematical Framework.

APPENDIX A: INPUT-OUTPUT INDUSTRY CLASSIFICATIONS

NAICS-Based Small (S), Medium (M), Historical Link (L) and Worksheet (W) Aggregation-Level Industries for Use with the Input-Output Tables, Make and Use Matrix, from 2002 and Onwards

Created by A. Trau, Statistics Canada
Revised: January 26, 2005

Notes:
1. The small (S) level industrial categories are expressed by a 2 character identification code
2. The medium (M) level industrial categories are expressed by a 3 character identification code
3. The historical link (L) level industrial categories are expressed by a 4 character identification code
4. The worksheet (W) level industrial categories are expressed by a 6 character identification code
Categories at the W level highlighted in grey represent an alternative W structure for use with the public files

BUSINESS SECTOR

1A CROP AND ANIMAL PRODUCTION

11A CROP AND ANIMAL PRODUCTION

11A0 Crop and Animal Production

111400 Greenhouse, Nursery and Floriculture Production
111A00 Crop Production (except Greenhouse, Nursery and Floriculture Production)
112500 Animal Aquaculture
112A00 Animal Production (except Animal Aquaculture)

1B FORESTRY AND LOGGING

113 FORESTRY AND LOGGING

1130 Forestry and Logging

113000 Forestry and Logging

1C FISHING, HUNTING AND TRAPPING

114 FISHING, HUNTING AND TRAPPING

1140 Fishing, Hunting and Trapping

114000 Fishing, Hunting and Trapping

1D SUPPORT ACTIVITIES FOR AGRICULTURE AND FORESTRY

115 SUPPORT ACTIVITIES FOR AGRICULTURE AND FORESTRY

1150 Support Activities for Agriculture and Forestry

115100 Support Activities for Crop Production
115200 Support Activities for Animal Production
115300 Support Activities for Forestry

21 MINING AND OIL AND GAS EXTRACTION

211 OIL AND GAS EXTRACTION

2111 Oil and Gas Extraction

211100 Oil and Gas Extraction

212 MINING (EXCEPT OIL AND GAS EXTRACTION)

2121 Coal Mining

212100 Coal Mining

2122 Metal Ore Mining

212210 Iron Ore Mining
212220 Gold and Silver Ore Mining
212230 Copper, Nickel, Lead and Zinc Ore Mining
212290 Other Metal Ore Mining

2123 Non-Metallic Mineral Mining and Quarrying

212310 Stone Mining and Quarrying
212320 Sand, Gravel, Clay, and Ceramic and Refractory Minerals Mining and Quarrying
212392 Diamond Mining
212393 Salt Mining
212394 Asbestos Mining
212396 Potash Mining
21239A Miscellaneous Non-Metallic Mineral Mining and Quarrying
21239X Asbestos and Other Non-Metallic Mineral Mining and Quarrying

213 SUPPORT ACTIVITIES FOR MINING AND OIL AND GAS EXTRACTION

2131 Support Activities for Mining and Oil and Gas Extraction

213100 Support Activities for Mining and Oil and Gas Extraction

22 UTILITIES

22A ELECTRIC POWER GENERATION, TRANSMISSION AND DISTRIBUTION

2211 Electric Power Generation, Transmission and Distribution

221100 Electric Power Generation, Transmission and Distribution

22B NATURAL GAS DISTRIBUTION, WATER, SEWAGE AND OTHER SYSTEMS

221A Natural Gas Distribution, Water, Sewage and Other Systems

221200 Natural Gas Distribution

221300 Water, Sewage and Other Systems

23 CONSTRUCTION

230 CONSTRUCTION

230A Residential Building Construction

2300A0 Residential Building Construction

230B Non-residential Building Construction

2300B0 Non-residential Building Construction

230C Transportation Engineering Construction

2300C0 Transportation Engineering Construction

230D Oil and Gas Engineering Construction

2300D0 Oil and Gas Engineering Construction

230E Electric Power Engineering Construction

2300E0 Electric Power Engineering Construction

230F Communication Engineering Construction

2300F0 Communication Engineering Construction

230G Other Engineering Construction

2300G0 Other Engineering Construction

230H Repair Construction

2300H0 Repair Construction

230I Other Activities of the Construction Industry

2300I0 Other Activities of the Construction Industry

3A MANUFACTURING

311 FOOD MANUFACTURING

3111 Animal Food Manufacturing

311100 Animal Food Manufacturing

3113 Sugar and Confectionery Product Manufacturing

311310 Sugar Manufacturing

3113A0 Confectionery Product Manufacturing

311300 Sugar and Confectionery Product Manufacturing

3114 Fruit and Vegetable Preserving and Specialty Food Manufacturing

311410 Frozen Food Manufacturing

311420 Fruit and Vegetable Canning, Pickling and Drying

3115 Dairy Product Manufacturing

311500 Dairy Product Manufacturing

3116 Meat Product Manufacturing

311611 Animal (except Poultry) Slaughtering

311614 Rendering and Meat Processing from Carcasses

311615 Poultry Processing

3117 Seafood Product Preparation and Packaging

311700 Seafood Product Preparation and Packaging

311A Miscellaneous Food Manufacturing

311210 Flour Milling and Malt Manufacturing

311220 Starch and Vegetable Fat and Oil Manufacturing

311230 Breakfast Cereal Manufacturing

311810 Bread and Bakery Product Manufacturing

311821 Cookie and Cracker Manufacturing

311822 Flour Mixes and Dough Manufacturing from Purchased Flour

31182A Dry Pasta and Tortilla Manufacturing

311910 Snack Food Manufacturing

311920 Coffee and Tea Manufacturing

3119A0 Other Miscellaneous Food Manufacturing

312 BEVERAGE AND TOBACCO PRODUCT MANUFACTURING

312A Soft Drink and Ice Manufacturing

312110 Soft Drink and Ice Manufacturing

312B Breweries

312120 Breweries

312C Wineries

312130 Wineries

312D Distilleries

312140 Distilleries

3122 Tobacco Manufacturing

312200 Tobacco Manufacturing

31A TEXTILE AND TEXTILE PRODUCT MILLS

31A0 Textile and Textile Product Mills

313100 Fibre, Yarn and Thread Mills
313200 Fabric Mills
313300 Textile and Fabric Finishing and Fabric Coating
314110 Carpet and Rug Mills
314120 Curtain and Linen Mills
314910 Textile Bag and Canvas Mills
314990 All Other Textile Product Mills

315 CLOTHING MANUFACTURING

3150 Clothing Manufacturing

315110 Hosiery and Sock Mills
315190 Other Clothing Knitting Mills
315210 Cut and Sew Clothing Contracting
315220 Men's and Boys' Cut and Sew Clothing Manufacturing
315230 Women's and Girls' Cut and Sew Clothing Manufacturing
315290 Other Cut and Sew Clothing Manufacturing
315900 Clothing Accessories and Other Clothing Manufacturing

316 LEATHER AND ALLIED PRODUCT MANUFACTURING

3160 Leather and Allied Product Manufacturing

316100 Leather and Hide Tanning and Finishing
316200 Footwear Manufacturing
316900 Other Leather and Allied Product Manufacturing

321 WOOD PRODUCT MANUFACTURING

3210 Wood Product Manufacturing

321100 Sawmills and Wood Preservation
321215 Structural Wood Product Manufacturing
32121A Veneer and Plywood Mills
32121B Particle Board, Fibreboard, and Waferboard Mills
321911 Wood Window and Door Manufacturing
321919 Other Millwork
321920 Wood Container and Pallet Manufacturing
321990 All Other Wood Product Manufacturing

322 PAPER MANUFACTURING

3221 Pulp Paper and Paperboard Mills

322110 Pulp Mills
322121 Paper (except Newsprint) Mills
322122 Newsprint Mills
322130 Paperboard Mills

3222 Converted Paper Product Manufacturing

322210 Paperboard Container Manufacturin
322220 Paper Bag and Coated and Treated Paper Manufacturing
322230 Stationery Product Manufacturing
322290 Other Converted Paper Product Manufacturing

323 PRINTING AND RELATED SUPPORT ACTIVITIES

3231 Printing and Related Support Activities

323110 Printing
323120 Support Activities for Printing

324 PETROLEUM AND COAL PRODUCTS MANUFACTURING

3241 Petroleum and Coal Products Manufacturing

324110 Petroleum Refineries
324120 Asphalt Paving, Roofing and Saturated Materials Manufacturing
324190 Other Petroleum and Coal Products Manufacturing 32419
3241X0 Petroleum Refineries and Other Petroleum and Coal Products Manufacturing

325 CHEMICAL MANUFACTURING

3251 Basic Chemical Manufacturing

325110 Petrochemical Manufacturing
325120 Industrial Gas Manufacturing
325130 Synthetic Dye and Pigment Manufacturing
3251A0 Other Basic Chemical Manufacturing

3252 Resin, Synthetic Rubber, and Artificial and Synthetic Fibres and Filaments Manufacturing

325200 Resin, Synthetic Rubber, and Artificial and Synthetic Fibres and Filaments Manufacturing

3253 Pesticides, Fertilizer and Other Agricultural Chemical Manufacturing

325310 Fertilizer Manufacturing
325320 Pesticide and Other Agricultural Chemical Manufacturing
325300 Pesticides, Fertilizer and Other Agricultural Chemical Manufacturing

3254 Pharmaceutical and Medicine Manufacturing

325400 Pharmaceutical and Medicine Manufacturing

325A Miscellaneous Chemical Product Manufacturing

325510 Paint and Coating Manufacturing
325520 Adhesive Manufacturing
325610 Soap and Cleaning Compound Manufacturing
325620 Toilet Preparation Manufacturing
325900 Other Chemical Product Manufacturing

326 PLASTICS AND RUBBER PRODUCTS MANUFACTURING

3261Plastic Product Manufacturing

326110 Unsupported Plastic Film, Sheet and Bag Manufacturing
326120 Plastic Pipe, Pipe Fitting and Unsupported Profile Shape Manufacturing
326130 Laminated Plastic Plate, Sheet and Shape Manufacturing
326160 Plastic Bottle Manufacturing
3261A0 Polystyrene, Urethane and Other Foam Product Manufacturing
326193 Motor Vehicle Plastic Parts Manufacturing
32619A Miscellaneous Plastic Product Manufacturing

3262 Rubber Product Manufacturing

326210 Tire Manufacturing
326220 Rubber and Plastic Hose and Belting Manufacturing
326290 Other Rubber Product Manufacturing

327 NON-METALLIC MINERAL PRODUCT MANUFACTURING

3273 Cement and Concrete Product Manufacturing

327310 Cement Manufacturing
327320 Ready-Mix Concrete Manufacturing
3273A0 Concrete Product Manufacturing

327A Miscellaneous Non-Metallic Mineral Product Manufacturing

327100 Clay Product and Refractory Manufacturing
327200 Glass and Glass Product Manufacturing
327400 Lime and Gypsum Product Manufacturing
327900 Other Non-Metallic Mineral Product Manufacturing

331 PRIMARY METAL MANUFACTURING

3310 Primary Metal Manufacturing

331100 Iron and Steel Mills and Ferro-Alloy Manufacturing
331210 Iron and Steel Pipes and Tubes Manufacturing from Purchased Steel
331220 Rolling and Drawing of Purchased Steel
331313 Primary Production of Alumina and Aluminum
331317 Aluminum Rolling, Drawing, Extruding and Alloying
331410 Non-Ferrous Metal (except Aluminum) Smelting and Refining
3314A0 Non-Ferrous Metal (except Aluminum) Rolling, Drawing, Extruding and Alloying
331510 Ferrous Metal Foundries
33151-331520 Non-Ferrous Metal Foundries

332 FABRICATED METAL PRODUCTS MANUFACTURING

3320 Fabricated Metal Product Manufacturing

332100 Forging and Stamping
332200 Cutlery and Hand Tool Manufacturing
332311 Prefabricated Metal Building and Component Manufacturing
33231A All Other Plate Work and Fabricated Structural Product Manufacturing
332320 Ornamental and Architectural Metal Products Manufacturing
332410 Power Boiler and Heat Exchanger Manufacturing
332420 Metal Tank (Heavy Gauge) Manufacturing
332430 Metal Can, Box and Other Metal Container (Light Gauge) Manufacturing
332500 Hardware Manufacturing
332600 Spring and Wire Product Manufacturing
332710 Machine Shops
332720 Turned Product and Screw, Nut and Bolt Manufacturing
332800 Coating, Engraving, Heat Treating and Allied Activities
332900 Other Fabricated Metal Product Manufacturing

333 MACHINERY MANUFACTURING

3330 Machinery Manufacturing

333110 Agricultural Implement Manufacturing
333120 Construction Machinery Manufacturing
333130 Mining and Oil and Gas Field Machinery Manufacturing
333200 Industrial Machinery Manufacturing
333300 Commercial and Service Industry Machinery Manufacturing
333400 Ventilation, Heating, Air-Conditioning and Commercial Refrigeration Equipment Manufacturing
333500 Metalworking Machinery Manufacturing
333600 Engine, Turbine and Power Transmission Equipment Manufacturing
333910 Pump and Compressor Manufacturing
333920 Material Handling Equipment Manufacturing
333990 All Other General-Purpose Machinery Manufacturing

333X00 Industrial, Commercial and Service Industry Machinery Manufacturing

334 COMPUTER AND ELECTRONIC PRODUCT MANUFACTURING

3341 Computer and Peripheral Equipment Manufacturing

334100 Computer and Peripheral Equipment Manufacturing

334A Electronic Product Manufacturing

334210 Telephone Apparatus Manufacturing
334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing
334290 Other Communications Equipment Manufacturing
334300 Audio and Video Equipment Manufacturing
334400 Semiconductor and Other Electronic Component Manufacturing
334500 Navigational, Measuring, Medical and Control Instruments Manufacturing
334600 Manufacturing and Reproducing Magnetic and Optical Media

3342X0 Telephone Apparatus, Radio and Television Broadcasting, and Wireless Communication Equipment Manufacturing

335 ELECTRICAL EQUIPMENT, APPLIANCE AND COMPONENT MANUFACTURING

3352 Household Appliance Manufacturing

335200 Household Appliance Manufacturing

335A Electrical Equipment and Component Manufacturing

335100 Electric Lighting Equipment Manufacturing
335311 Power, Distribution and Specialty Transformers Manufacturing
335312 Motor and Generator Manufacturing
335315 Switchgear and Switchboard, and Relay and Industrial Control Apparatus Manufacturing
335910 Battery Manufacturing
335920 Communication and Energy Wire and Cable Manufacturing
3359A0 Wiring Devices and All Other Electrical Equipment and Component Manufacturing

336 TRANSPORTATION EQUIPMENT MANUFACTURING

3361 Motor Vehicle Manufacturing

336110 Automobile and Light-Duty Motor Vehicle Manufacturing
336120 Heavy-Duty Truck Manufacturing

336100 Motor Vehicle Manufacturing

3362 Motor Vehicle Body and Trailer Manufacturing

336200 Motor Vehicle Body and Trailer Manufacturing

3363 Motor Vehicle Parts Manufacturing

336310 Motor Vehicle Gasoline Engine and Engine Parts Manufacturing
336320 Motor Vehicle Electrical and Electronic Equipment Manufacturing
336330 Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing
336340 Motor Vehicle Brake System Manufacturing
336350 Motor Vehicle Transmission and Power Train Parts Manufacturing
336360 Motor Vehicle Seating and Interior Trim Manufacturing
336370 Motor Vehicle Metal Stamping
336390 Other Motor Vehicle Parts Manufacturing

336300 Motor Vehicle Parts Manufacturing

3364 Aerospace Product and Parts Manufacturing

336400 Aerospace Product and Parts Manufacturing

3365 Railroad Rolling Stock Manufacturing

336500 Railroad Rolling Stock Manufacturing

3366 Ship and Boat Building

336611 Ship Building and Repairing
336612 Boat Building

3369 Other Transportation Equipment and Manufacturing

336900 Other Transportation Equipment Manufacturing

337 FURNITURE AND RELATED PRODUCT MANUFACTURING

3370 Furniture and Related Product Manufacturing

337110 Wood Kitchen Cabinet and Counter Top Manufacturing
337127 Institutional Furniture Manufacturing
33712A Household Furniture Manufacturing
337200 Office Furniture (including Fixtures) Manufacturing
337900 Other Furniture-Related Product Manufacturing

339 MISCELLANEOUS MANUFACTURING

3390 Miscellaneous Manufacturing

339100 Medical Equipment and Supplies Manufacturing
339910 Jewellery and Silverware Manufacturing
339920 Sporting and Athletic Goods Manufacturing
339930 Doll, Toy and Game Manufacturing
339940 Office Supplies (except Paper) Manufacturing
339950 Sign Manufacturing
339990 All Other Miscellaneous Manufacturing

3399X0 Jewellery, Silverware and All Other Miscellaneous Manufacturing

41 WHOLESALE TRADE

410 WHOLESALE TRADE

4100 Wholesale Trande

410000 Wholesale Trade

4A RETAIL TRADE

4A0 RETAIL TRADE

4A00 Retail Trade

4A0000 Retail Trade

4B TRANSPORTATION AND WAREHOUSING

484 TRUCK TRANSPORTATION

4840 Truck Transportation

484000 Truck Transportation

485 TRANSIT AND GROUND PASSENGER TRANSPORTATION

4850 Transit and Ground Passenger Transportation

485100 Urban Transit Systems
485200 Interurban and Rural Bus Transportation
485300 Taxi and Limousine Service
485A00 All Other Transit and Ground Passenger Transportation

486 PIPELINE TRANSPORTATION

4860 Pipeline Transportation

486200 Pipeline Transportation of Natural Gas
486A00 Crude Oil and Other Pipeline Transportation

48A OTHER TRANSPORTATION

4810 Air Transportation

481000 Air Transportation

4820 Rail Transportation

482000 Rail Transportation

4830 Water Transportation

483000 Water Transportation

48B0 Scenic and Sightseeing Transportation and Support Activities for Transportation

487000 Scenic and Sightseeing Transportation
488000 Support Activities for Transportation

49A POSTAL SERVICE AND COURIERS AND MESSENGERS

49A0 Postal Service and Courier and Messengers

491000 Postal Service
492000 Couriers and Messengers
49X000 Postal Service and Couriers and Messengers

493 WAREHOUSING AND STORAGE

4930 Warehousing and Storage

493130 Farm Product Warehousing and Storage
4931A0 All Other Warehousing and Storage

51 INFORMATION AND CULTURAL INDUSTRIES

512 MOTION PICTURE AND SOUND RECORDING INDUSTRIES

5120 Motion Picture and Sound Recording Industries

512130 Motion Picture and Video Exhibition
5121A0 Motion Picture and Video Production, Distribution, Post-Production and Other Motion Picture and Video Industries
512200 Sound Recording Industries

513 BROADCASTING AND TELECOMMUNICATIONS

5131 Radio and Television Broadcasting

515100 Radio and Television Broadcasting (except Internet)

513A Pay TV, Specialty TV and Program Distribution and Telecommunications

515200 Pay and Specialty Television
517500 Cable and Other Program Distribution
517A00 Telecommunications except Cable and Other Program Distribution

51A PUBLISHING INDUSTRIES, INFORMATION SERVICES AND DATA PROCESSING SERVICES

51A0 Publishing Industries, Information Services and Data Processing Services

511A00 Newspaper, Periodical, Book and Directory Publishers (except by Internet
511200 Software Publishers
516000 Internet Publishing and Broadcasting
518100 Internet Service Providers, Web Search Portals
518200 Data Processing, Hosting, and Related Services
519000 Other Information Services

5A FINANCE, INSURANCE, REAL ESTATE AND RENTAL AND LEASING

5A0 FINANCE, INSURANCE, REAL ESTATE AND RENTAL AND LEASING

5A01 Monetary Authorities and Depository Credit Intermediation

5A0110 Monetary Authorities - Central Bank

5A0120 Local Credit Unions
5A0130 Banking and Other Depository Credit Intermediation

5A02 Insurance Carriers

5A0200 Insurance Carriers

5A03 Lessors of Real Estate

5A0300 Lessors of Real Estate

5A04 Owner-Occupied Dwellings

5A0400 Owner-Occupied Dwellings

5A05 Rental and Leasing Services and Lessors of Non-Financial Intangible Assets (except copyrighted works)

5A0510 Automotive Equipment Rental and Leasing
5A0520 Rental and leasing (except Automotive Equipment) and Lessors of Non-Financial Intangible Assets (except Copyrighted Works)
5A0610 Non-Depository Credit Intermediation and Activities Related to Credit Intermediation
5A0620 Agencies, Brokerages and Other Insurance Related Activities
5A0630 Securities, Commodity Contracts, Funds, and Other Financial Investment and Financial Vehicles
5A0640 Offices of Real Estate Agents and Brokers and Activities Related to Real Estate
5A0650 Management of Companies and Enterprises

54 PROFESSIONAL, SCIENTIFIC AND TECHNICAL SERVICES

541 PROFESSIONAL, SCIENTIFIC AND TECHNICAL SERVICES

5418 Advertising and Related Services

541800 Advertising and Related Services

541A Legal, Accounting and Architectural, Engineering and Related Services

541A00 Legal, Accounting, Tax Preparation, Bookkeeping and Payroll Services
541300 Architectural, Engineering and Related Services

541B Computer Systems Design and Other Professional, Scientific and Technical Services

541500 Computer Systems Design and Related Services
541B00 Other Professional, Scientific and Technical Services

56 ADMINISTRATIVE AND SUPPORT, WASTE MANAGEMENT AND REMEDIATION SERVICES

561 ADMINISTRATIVE AND SUPPORT SERVICES

5610 Administrative and Support Services

561500 Travel Arrangement and Reservation Services
561600 Investigation and Security Services
561700 Services to Buildings and Dwellings
561A00 Other Administrative and Support Services

562 WASTE MANAGEMENT AND REMEDIATION SERVICES

5620 Waste Management and Remediation Services

562000 Waste Management and Remediation Services

61 EDUCATIONAL SERVICES

610 EDUCATIONAL SERVICES

611A Educational Services (Except Universities)

611B00 Other Schools, Instruction and Educational Support Services

62 HEALTH CARE AND SOCIAL ASSISTANCE

620 HEALTH CARE AND SOCIAL ASSISTANCE

620A Health Care Services (Except Hospitals) and Social Assistance

621100 Offices of Physicians
621200 Offices of Dentists
621A00 Miscellaneous Ambulatory Health Care Services
623000 Nursing and Residential Care Facilities
624000 Social Assistance

71 ARTS, ENTERTAINMENT AND RECREATION

710 ARTS, ENTERTAINMENT AND RECREATION

7100 Arts, Entertainment and Recreation

711000 Performing Arts, Spectator Sports and Related Industries
712000 Heritage Institutions
713200 Gambling Industries
713A00 Amusement and Recreation Industries

72 ACCOMMODATION AND FOOD SERVICES

720 ACCOMMODATION AND FOOD SERVICES

7200 Accommodation and Food Services

721100 Traveller Accommodation
721A00 RV (Recreational Vehicle) Parks, Recreational Camps, and Rooming and Boarding Houses
722000 Food Services and Drinking Places

81 OTHER SERVICES (EXCEPT PUBLIC ADMINISTRATION)

811 REPAIR AND MAINTENANCE

8110 Repair and Maintenance

811100 Automotive Repair and Maintenance

811A00 Repair and Maintenance (except Automotive Repair and Maintenance)

813 GRANT-MAKING, CIVIC, AND PROFESSIONAL AND SIMILAR ORGANIZATIONS

813A Grant-Making, Civic, and Professional and Similar Organizations

813A00 Grant-Making, Civic, and Professional and Similar Organizations

81A PERSONAL AND LAUNDRY SERVICES AND PRIVATE HOUSEHOLDS

81A0 Personal and Laundry Services and Private Households

812200 Funeral Services

812300 Dry Cleaning and Laundry Services

812A00 Personal Care Services and Other Personal Services

814000 Private Households

F1 OPERATING, OFFICE, CAFETERIA AND LABORATORY SUPPLIES NOT NAICS DEFINED

F10 OPERATING, OFFICE, CAFETERIA AND LABORATORY SUPPLIES

F10 1 Operating Supplies

F10100 Operating Supplies

F102 Office Supplies

F10200 Office Supplies

F103 Cafeteria Supplies

F10300 Cafeteria Supplies

F104 Laboratory Supplies

F10400 Laboratory Supplies

F2 TRAVEL, ENTERTAINMENT, ADVERTISING AND PROMOTION NOT NAICS DEFINED

F20 TRAVEL, ENTERTAINMENT, ADVERTISING AND PROMOTION

F201 Travel and Entertainment

F20100 Travel and Entertainment

F202 Advertising and Promotion

F20200 Advertising and Promotion

F3 TRANSPORTATION MARGINS NOT NAICS DEFINED

F30 TRANSPORTATION MARGINS

F300 Transportation Margins

F30000 Transportation Margins

NON-BUSINESS SECTOR

NP NON-PROFIT INSTITUTIONS SERVING HOUSEHOLDS

NP1 NON-PROFIT INSTITUTIONS SERVING HOUSEHOLDS (EXCLUDING EDUCATION)

NP11 Religious Organizations

NP1100 Religious Organizations

NP12 Non-Profit Social Assistance

NP1200 Non-Profit Welfare Organizations

NP13 Non-Profit Arts, Entertainment and Recreation

NP1300 Non-Profit Sports and Recreation Clubs

NP19 Other Non-Profit Education Services

NP1900 Other Non-Profit Institutions Serving Households

NP2 NON-PROFIT EDUCATION SERVICES

NP20 Non-Profit Education Services

NP2000 Non-Profit Education Institutions

GS GOVERNMENT SECTOR

GS1 HOSPITALS AND GOVERNMENT NURSING AND RESIDENTIAL CARE FACILITIES

GS11 Hospitals

GS1100 Hospitals

GS12 Government Nursing and Residential Care Facilities

GS1200 Government Residential Care Facilities

GS2 UNIVERSITIES AND GOVERNMENT EDUCATION SERVICES

GS21 Universities

GS2100 Universities

GS22 Government Education Services

GS2210 Government Elementary and Secondary Schools

GS2220 Government Community Colleges and C.E.G.E.P.s6112

GS2230 Other Government Education Services

GS4 OTHER MUNICIPAL GOVERNMENT SERVICES

GS40 Other Municipal Government Services

GS4000 Other Municipal Government Services

GS5 OTHER PROVINCIAL AND TERRITORIAL GOVERNMENT SERVICES

GS50 Other Provincial and Territorial Government Services

GS5000 Other Provincial and Territorial Government Services

GS6 OTHER FEDERAL GOVERNMENT SERVICES

GS60 Other Federal Government Services

GS3000 Defence Services

GS6000 Other Federal Government Services

GSX000 Other Federal Government Services including Defence

Unallocated

GS7000 Other Aboriginal Government Services

Note: The data contents of W GS7000 are found in W NP1900. As soon as data becomes available for NAICS 914, a structure will be introduced at the S, M and L levels. Prepared by A. Trau 951-2794

APPENDIX B: TRI-COUNCIL, SCI AND NEI DIRECT RESEARCH EXPENDITURES ON ECONOMIC ACTIVITIES IN EACH TERRITORY 2000-2009

Table B.1: Northwest Territories Tri-Council, SCI and NEI Expenditures

	Input Output Code	GS	54	56	F1			48			72		Total
		GS2100	541B00	561A00	F10100	F10200	F10400	485A00	481000	488000	721100	722000	
	Statistics Canada Definition	Universities	Other Professional, Scientific and Technical Services	Other Administration and Support Services	Operating Supplies	Office Supplies	Laboratory Supplies	All other Transit and Ground Passenger Tranportation	Air Transport	Support Activities for Transport	Traveller Accommodation	Food Services and Drinking Places	
2000	Total Budget	62,500	75,500	0	425	300	0	250	17,015	0	300	2,640	158,930
	Territorial Expenditures	0	2,000	0	0	0	0	0	0	0	0	2,640	4,640
	Proportion spent in territory	0.000	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	
2001	Total Budget	100,000	89,585	2,250	21,925	7,415	0	12,745	52,040	0	26,820	0	312,780
	Territorial Expenditures	0	11,900	2,250	0	0	0	12,600	6,500	0	26,820	0	60,070
	Proportion spent in territory	0.000	0.133	1.000	0.000	0.000	0.000	0.989	0.125	0.000	1.000	N/A	
2002	Total Budget	164,500	128,260	11600	15,775	950	2,000	4,850	43,600	0	4,520	1000	377,055
	Territorial Expenditures	0	3,500	500	0	0	0	4,750	6,000	0	4,520	1000	20,270
	Proportion spent in territory	0.000	0.027	0.043	0.000	0.000	0.000	0.979	0.138	0.000	1.000	1.000	
2003	Total Budget	65,500	68,280	5700	4,750	0	2,000	3,750	24,400	0	750	1250	176,380
	Territorial Expenditures												
	Proportion spent in territory	0	6500	500	0	0	0	3,750	3,000	0	750	1250	15,750

Table B.1 (Continued): Northwest Territories Tri-Council, SCI and NEI Expenditures

	Input Output Code	GS	54	56	F1			48			72		Total
		GS2100	541B00	561A00	F10100	F10200	F10400	485A00	481000	488000	721100	722000	
	Statistics Canada Definition	Universities	Other Professional, Scientific and Technical Services	Other Administration and Support Services	Operating Supplies	Office Supplies	Laboratory Supplies	All other Transit and Ground Passenger Tranportation	Air Transport	Support Activities for Transport	Traveller Accommodation	Food Services and Drinking Places	
2004	Total Budget	49,000	66,550	7250	3,000	2,000	900	3,300	27,750	500	2,115	3,795	166,160
	Territorial Expenditures	0	8,750	750	0	0	0	3,300	4,600	500	2,115	3,595	23,610
	Proportion spent in territory	0.000	0.131	0.103	0.000	0.000	0.000	1.000	0.166	1.000	1.000	0.947	
2005	Total Budget	121,000	50,150	84,900	3,700	500	0	10,580	50,833	0	6,298	6,828	334,789
	Territorial Expenditures	0	3,750	750	0	0	0	10,580	5,983	0	6,298	6,828	34,189
	Proportion spent in territory	0.000	0.075	0.009	0.000	0.000	0.000	1.000	0.118	0.000	1.000	1.000	
2006	Total Budget	300,417	160,171.7	91,508.33	42,156	4,468	39,829	8,350	221,138	275	11,030	14,342	893,685
	Territorial Expenditures	0	328,25	1,000	0	0	0	8,350	18,500	275	10,405	13,142	84,497
	Proportion spent in territory	0.000	0.205	0.011	0.000	0.000	0.000	1.000	0.084	1.000	0.943	0.916	
2007	Total Budget	460415	225608.17	37126.75	54483.33	13739.67	32114.00	17,354	360,148	275	20533	13711	1235508
	Territorial Expenditures	2661	31266.67	2500	0	0	0	14,154	140,600	275	20533	12011	224000.7
	Proportion spent in territory	0.006	0.139	0.067	0.000	0.000	0.000	0.816	0.390	1.000	1.000	0.876	

Table B.1 (Continued): Northwest Territories Tri-Council, SCI and NEI Expenditures

	Input Output Code	GS	54	56	F1			48			72		Total
		GS2100	541B00	561A00	F10100	F10200	F10400	485A00	481000	488000	721100	722000	
	Statistics Canada Definition	Universities	Other Professional, Scientific and Technical Services	Other Administration and Support Services	Operating Supplies	Office Supplies	Laboratory Supplies	All other Transit and Ground Passenger Tranportation	Air Transport	Support Activities for Transport	Traveller Accommodation	Food Services and Drinking Places	
2008	Total Budget	332,715.7	224,935.97	39,440	139,001.30	8,050	99,689.00	14,304	399,787	275	22,350	12,911	1293,459
2008	Territorial Expenditures	2,661	35,941.67	2,500	0	0	0	12,154	139,600	275	21,725	12,911	227,767.7
2008	Proportion spent in territory	0.008	0.160	0.063	0.000	0.000	0.000	0.850	0.349	1.000	0.972	1.000	
2009	Total Budget	264137.7	98061.67	37600	101133.30	3100	66800.00	11,754	95,522	275	18000	11117	707500.7
2009	Territorial Expenditures	2661	14625	2500	0	0	0	10,254	29,600	275	17200	11117	88232
2009	Proportion spent in territory	0.010	0.149	0.066	0.000	0.000	0.000	0.872	0.310	1.000	0.956	1.000	

Table B.2: Nunavut Territory Tri-Council, SCI and NEI Expenditures

	Input Output Code	GS	54	56	F1			48			72		Total
		GS2100	541B00	561A00	F10100	F10200	F10400	485A00	481000	488000	721100	722000	
	Statistics Canada Definition	Universities	Other Professional, Scientific and Technical Services	Other Administration and Support Services	Operating Supplies	Office Supplies	Laboratory Supplies	All other Transit and Ground Passenger Tranportation	Air Transport	Support Activities for Transport	Traveller Accommodation	Food Services and Drinking Places	
2000	Total Budget	0	16,300	500	675	3150	0	250	7,200	0	4,510	252	32,837
	Territorial Expenditures	0	8,400	0	0	0	0	250	0	0	4,510	0	13,160
	Proportion spent in territory	0.000	0.515	0.000	0.000	0.000	0.000	1.000	0.000	0.000	1.000	0.000	
2001	Total Budget	8,000	36,000	0	35,325	6,300	0	395	41,950	0	2,500	3,002	133,472
	Territorial Expenditures	0	3,000	0	0	0	0	250	0	0	2,500	2,750	8,500
	Proportion spent in territory	0.000	0.083	0.000	0.000	0.000	0.000	0.633	0.000	0.000	1.000	0.916	
2002	Total Budget	18,000	134,588	20,100	9,325	7,300	0	250	63,450	0	13,350	2,860	269,223
	Territorial Expenditures	0	18,400	0	0	0	0	250	0	0	13,350	2,860	34,860
	Proportion spent in territory	0.000	0.137	0.000	0.000	0.000	0.000	1.000	0.000	0.000	1.000	1.000	
2003	Total Budget	23,500	97,930	18,079	10,667	7,160	0	144	45,616	0	4,774	332	208,201.1
	Territorial Expenditures	6,500	12,174	0	0	0	0	0	0	0	4,774	332	23,780
	Proportion spent in territory	0.000	0.124	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	1.000	

Table B.2 (Continued): Nunavut Territory Tri-Council, SCI and NEI Expenditures

	Input Output Code	GS	54	56	F1			48			72		Total
		GS2100	541B00	561A00	F10100	F10200	F10400	485A00	481000	488000	721100	722000	
	Statistics Canada Definition	Universities	Other Professional, Scientific and Technical Services	Other Administration and Support Services	Operating Supplies	Office Supplies	Laboratory Supplies	All other Transit and Ground Passenger Tranportation	Air Transport	Support Activities for Transport	Traveller Accommodation	Food Services and Drinking Places	
2004	Total Budget	50,600	129,820	7,680	23,200	12,000	7,500	1,554	55,800	0	18,045	17,885	324,083.5
	Territorial Expenditures		25,430	2,600	0	0	0	1,500	0	0	18,045	17,885	65,460
	Proportion spent in territory	0.000	0.196	0.339	0.000	0.000	0.000	0.966	0.000	0.000	1.000	1.000	
2005	Total Budget	134,022	253,241	41,312	38,253	6,931	5,500	12,500	100,410	0	40,985	17,654	650,808
	Territorial Expenditures		22,155	16,356	0	0	0	12,500	0	0	40,985	17,254	109,250
	Proportion spent in territory	0.000	0.087	0.396	0.000	0.000	0.000	1.000	0.000	0.000	1.000	0.977	
2006	Total Budget	1,292,902	674,543	62,827	185,600	10,067	98,315	15,600	269,215	275	50,025	60,584	2,719,953
	Territorial Expenditures		90,955	34,200	0	0	0	13,600	12,000	275	50,025	60,384	261,439
	Proportion spent in territory	0.000	0.135	0.544	0.000	0.000	0.000	0.872	0.045	1.000	1.000	0.997	
2007	Total Budget	1,335,894	818,730	50,298	147,528	5,157	109,760	5,617	350,575	475	29,105	24,077	2,877,215
	Territorial Expenditures	10,000	204,483	5,550	0	0	0	5,267	12,500	475	25,530	24,077	287,882
	Proportion spent in territory	0.007	0.250	0.110	0.000	0.000	0.000	0.938	0.036	1.000	0.877	1.000	

Table B.2 (Continued): Nunavut Territory Tri-Council, SCI and NEI Expenditures

	Input Output Code	GS	54	56	F1			48			72		Total
		GS2100	541B00	561A00	F10100	F10200	F10400	485A00	481000	488000	721100	722000	
	Statistics Canada Definition	Universities	Other Professional, Scientific and Technical Services	Other Administration and Support Services	Operating Supplies	Office Supplies	Laboratory Supplies	All other Transit and Ground Passenger Tranportation	Air Transport	Support Activities for Transport	Traveller Accommodation	Food Services and Drinking Places	
2008	Total Budget	1,467,116	758,701	103,512	202,541	17,382	121,360	9,107	329,552	275	44,970	46,337	3,100,852
	Territorial Expenditures	3,200	222,472	4,800	0	0	0	8,107	18,500	275	39,540	44,697	341,591
	Proportion spent in territory	0.002	0.293	0.046	0.000	0.000	0.000	0.890	0.056	1.000	0.879	0.965	
2009	Total Budget	383,267	114,334	103,022	44,601	7,525	120,907	7,997	298,029	675	26,270	17,164	1,123,790
	Territorial Expenditures		35,295	0	0	0	0	7,997	16,650	675	21,445	16,804	98,866
	Proportion spent in territory	0.000	0.309	0.000	0.000	0.000	0.000	1.000	0.056	1.000	0.816	0.979	

Table B.3: Yukon Territory Tri-Council, SCI and NEI Expenditures

	Input Output Code	GS	54	56	F1			48			72		Total
		GS2100	541B00	561A00	F10100	F10200	F10400	485A00	481000	488000	721100	722000	
	Statistics Canada Definition	Universities	Other Professional, Scientific and Technical Services	Other Administration and Support Services	Operating Supplies	Office Supplies	Laboratory Supplies	All other Transit and Ground Passenger Tranportation	Air Transport	Support Activities for Transport	Traveller Accommodation	Food Services and Drinking Places	
2000	Total Budget	40,500	4,900	19,900	1,400	0	3,000	1,290	8,100	500	4,000	1,452	40,500
	Territorial Expenditures	0	0	0	0	0	0	1,000	0	500	4,000	1,200	0
	Proportion spent in territory	0.000	0.000	0.000	0.000	0.000	0.000	0.775	0.000	1.000	1.000	0.826	0.000
2001	Total Budget	49,500	71,300	5,000	21,147	10,000	6,000	0	6,700	0	4,850	252	49,500
	Territorial Expenditures	0	0	0	0	0	0	0	0	0	4,500	0	0
	Proportion spent in territory	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.928	0.000	0.000
2002	Total Budget	119,100	148,660	24,610	22,050	1,050	5,000	13,700	42,100	1,000	8,800	3,780	119,100
	Territorial Expenditures	0	2,750	500	0	0	0	13,700	7,000	1,000	8,400	3,780	0
	Proportion spent in territory	0.000	0.018	0.020	0.000	0.000	0.000	1.000	0.166	1.000	0.955	1.000	0.000
2003	Total Budget	135,420	187,404	36,614	25,852	11,088	6,158	9,150	67,650	0	10,511	1,200	135,420
	Territorial Expenditures	0	20,984	500	0	0	0	9,150	22,000	0	10,511	1,200	0
	Proportion spent in territory	0.000	0.112	0.014	0.000	0.000	0.000	1.000	0.325	0.000	1.000	1.000	0.000

Table B.3 (Continued): Yukon Territory Tri-Council, SCI and NEI Expenditures

	Input Output Code	GS	54	56	F1			48			72		Total
		GS2100	541B00	561A00	F10100	F10200	F10400	485A00	481000	488000	721100	722000	
	Statistics Canada Definition	Universities	Other Professional, Scientific and Technical Services	Other Administration and Support Services	Operating Supplies	Office Supplies	Laboratory Supplies	All other Transit and Ground Passenger Tranportation	Air Transport	Support Activities for Transport	Traveller Accommodation	Food Services and Drinking Places	
2004	Total Budget	120,320	155,380	13,050	12,800	4,130	4,000	5,000	68,650	1,000	15,230	5,680	120,320
	Territorial Expenditures	0	2,250	750	0	0	0	5,000	23,600	1,000	15,230	5,480	0
	Proportion spent in territory	0.000	0.014	0.057	0.000	0.000	0.000	1.000	0.344	1.000	1.000	0.965	0.000
2005	Total Budget	163,407	125,710	27,175	7,400	4,000	1,000	22,540	88,508	750	11,228	9,378	163,407
	Territorial Expenditures	0	2,250	750	0	0	0	22,540	41,108	750	11,228	9,378	0
	Proportion spent in territory	0.000	0.018	0.028	0.000	0.000	0.000	1.000	0.464	1.000	1.000	1.000	0.000
2006	Total Budget	486,984	218,240	39,193	85,506	4,275	9,660	19,172	218,710	1,850	22,555	42,515	486,984
	Territorial Expenditures	0	12,000	1,000	0	0	0	18,822	80,125	1,850	22,555	42,315	0
	Proportion spent in territory	0.000	0.055	0.026	0.000	0.000	0.000	0.982	0.366	1.000	1.000	0.995	0.000
2007	Total Budget	694,953	252,781	95,034	108,408	10,982	18,760	27,711	295,160	4,360	37,950	55,342	694,953
	Territorial Expenditures	2,661	16,717	0	0	0	0	26,211	109,025	4,360	37,950	55,342	2,661
	Proportion spent in territory	0.004	0.066	0.000	0.000	0.000	0.000	0.946	0.369	1.000	1.000	1.000	0.004

Table B.3 (Continued): Yukon Territory Tri-Council, SCI and NEI Expenditures

	Input Output Code	GS	54	56	F1			48			72		Total
		GS2100	541B00	561A00	F10100	F10200	F10400	485A00	481000	488000	721100	722000	
	Statistics Canada Definition	Universities	Other Professional, Scientific and Technical Services	Other Administration and Support Services	Operating Supplies	Office Supplies	Laboratory Supplies	All other Transit and Ground Passenger Tranportation	Air Transport	Support Activities for Transport	Traveller Accommodation	Food Services and Drinking Places	
2008	Total Budget	1,018,500	327,749	71,610	6,545	24,782	115,008	31,211	289,737	4,300	72,454	69,782	1,018,500
	Territorial Expenditures	2,661	13,567	0	0	0	0	27,091	83,375	4,300	71,704	69,032	2,661
	Proportion spent in territory	0.003	0.041	0.000	0.000	0.000	0.000	0.868	0.288	1.000	0.990	0.989	0.003
2009	Total Budget	740,944	262,124	66,270	23,331	14,325	27,660	24,486	282,907	4,260	46,755	51,169	740,944
	Territorial Expenditures	2,661	4,000	1,000	0	0	0	22,336	111,795	4,260	46,755	50,419	2,661
	Proportion spent in territory	0.004	0.015	0.015	0.000	0.000	0.000	0.912	0.395	1.000	1.000	0.985	0.004

APPENDIX C: STATISTICS CANADA, INDUSTRY ACCOUNTS DIVISION / SYSTEM OF NATIONAL ACCOUNTS INPUT-OUTPUT MULTIPLIERS 2000-2007

Table C.1 Northwest Territories Statistics Canada Multipliers

2000	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	Employment (per million $)	Wages and Salaries	Total GDP	Output	Employment (per million $)
Universities	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.35	0.36	1	20.41	0.46	0.70	1.18	24.81
Other Administrative and Support Services	0.51	0.68	1	18.83	0.35	0.57	1.26	14.32
All other Transit and Ground Passenger	0.26	0.54	1	11.40	0.49	0.80	1.18	13.27
Air Transport	x	x	x	x	0.30	0.49	1.29	8.17
Support for Transport	x	x	x	x	0.32	0.56	1.30	8.72
Traveller Accommodation	x	x	x	x	0.43	0.73	1.24	20.12
Food Services and Drinking Places	0.31	0.48	1	19.80	0.39	0.58	1.23	23.73

2001	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	Employment (per million $)	Wages and Salaries	Total GDP	Output	Employment (per million $)
Universities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.36	0.38	1	14.72	0.42	0.52	1.26	16.51
Other Administrative and Support Services	0.53	0.69	1	15.38	0.57	0.79	1.17	16.44
All other Transit and Ground Passenger	0.25	0.56	1	7.35	0.32	0.68	1.29	8.88
Air Transport	x	x	x	x	0.35	0.45	1.26	7.43
Support for Transport	x	x	x	x	0.36	0.58	1.27	9.43
Traveller Accommodation	x	x	x	x	0.39	0.70	1.26	15.96
Food Services and Drinking Places	0.31	0.49	1	22.40	0.35	0.57	1.18	23.53

Table C.1 (Continued) Northwest Territories Statistics Canada Multipliers

2002

	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	Employment (per million $)	Wages and Salaries	Total GDP	Output	Employment (per million $)
Universities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.40	0.46	1.00	14.07	0.46	0.59	1.23	15.74
Other Administrative and Support Services	0.48	0.65	1.00	13.47	0.52	0.74	1.17	14.73
All other Transit and Ground Passenger	0.46	0.48	1.00	18.27	0.59	0.68	1.42	20.50
Air Transport	x	x	x	x	0.35	0.46	1.29	7.45
Support for Transport	x	x	x	x	0.40	0.65	1.33	10.74
Traveller Accommodation	x	x	x	x	0.40	0.73	1.24	16.37
Food Services and Drinking Places	0.31	0.51	1.00	20.25	0.36	0.59	1.17	21.45

2003

	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	Employment (per million $)	Wages and Salaries	Total GDP	Output	Employment (per million $)
Universities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.40	0.53	1.00	13.17	0.46	0.63	1.19	14.54
Other Administrative and Support Services	0.65	0.78	1.00	14.93	0.68	0.85	1.13	15.69
All other Transit and Ground Passenger	0.36	0.57	1.00	12.99	0.47	0.73	1.28	14.68
Air Transport	x	x	x	x	0.29	0.37	1.30	5.66
Support for Transport	x	x	x	x	0.43	0.66	1.30	11.63
Traveller Accommodation	x	x	x	x	0.39	0.73	1.21	14.10
Food Services and Drinking Places	0.31	0.50	1.00	18.04	0.35	0.59	1.17	19.16

Table C.1 (Continued) Northwest Territories Statistics Canada Multipliers

2004

	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	Employment (per million $)	Wages and Salaries	Total GDP	Output	Employment (per million $)
Universities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.40	0.56	1.00	12.18	0.46	0.67	1.20	13.61
Other Administrative and Support Services	0.65	0.78	1.00	17.72	0.68	0.86	1.13	18.50
All other Transit and Ground Passenger	0.31	0.63	1.00	14.12	0.35	0.73	1.17	15.17
Air Transport	x	x	x	x	0.25	0.35	1.31	5.24
Support for Transport	x	x	x	x	0.39	0.67	1.31	10.92
Traveller Accommodation	x	x	x	x	0.38	0.72	1.22	12.72
Food Services and Drinking Places	0.31	0.50	1.00	18.16	0.35	0.58	1.15	19.15

2005

	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	# of Jobs (per million $)	Wages and Salaries	Total GDP	Output	# of Jobs (per million $)
Universities	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.43	0.59	1	12.32	0.49	0.70	1.21	12.25
Other Administrative and Support Services	0.66	0.79	1	13.26	0.69	0.86	1.13	11.90
All other Transit and Ground Passenger	0.24	0.74	1	9.27	0.27	0.81	1.12	8.38
Air Transport	x	x	x	x	0.20	0.38	1.25	3.14
Support for Transport	x	x	x	x	0.33	0.65	1.32	4.82
Traveller Accommodation	x	x	x	x	0.38	0.73	1.22	6.79
Food Services and Drinking Places	0.32	0.50	1	15.57	0.36	0.58	1.16	11.96

Table C.1 (Continued) Northwest Territories Statistics Canada Multipliers

2006

	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	# of Jobs (per million $)	Wages and Salaries	Total GDP	Output	# of Jobs (per million $)
Universities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.44	0.59	1.00	11.97	0.49	0.70	1.20	13.00
Other Administrative and Support Services	0.72	0.80	1.00	14.07	0.75	0.87	1.12	14.64
All other Transit and Ground Passenger	0.20	0.74	1.00	9.04	0.23	0.80	1.12	9.62
Air Transport	x	x	x	x	0.20	0.39	1.28	3.45
Support for Transport	x	x	x	x	0.38	0.64	1.30	5.75
Traveller Accommodation	x	x	x	x	0.37	0.71	1.23	8.21
Food Services and Drinking Places	0.30	0.48	1.00	12.80	0.34	0.57	1.16	13.65

2007

	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	# of Jobs (per million $)	Wages and Salaries	Total GDP	Output	# of Jobs (per million $)
Universities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.44	0.59	1.00	11.25	0.49	0.69	1.19	12.13
Other Administrative and Support Services	0.75	0.83	1.00	11.12	0.77	0.88	1.10	11.58
All other Transit and Ground Passenger	0.22	0.79	1.00	11.76	0.24	0.83	1.08	12.12
Air Transport	x	x	x	x	0.21	0.39	1.26	3.33
Support for Transport	x	x	x	x	0.39	0.65	1.32	5.46
Traveller Accommodation	x	x	x	x	0.41	0.72	1.21	8.44
Food Services and Drinking Places	0.33	0.50	1.00	11.63	0.37	0.58	1.15	12.35

Table C.2 Nunavut Territory Statistics Canada Multipliers

2000								
	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	Employment (per million $)	Wages and Salaries	Total GDP	Output	Employment (per million $)
Universities	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.34	0.45	1	55.22	0.38	0.55	1.20	57.18
Other Administrative and Support Services	0.38	0.53	1	20.66	0.43	0.63	1.20	22.53
All other Transit and Ground Passenger	x	x	x	x	0.31	0.66	1.10	14.59
Air Transport	x	x	x	x	0.36	0.50	1.29	13.81
Support for Transport	x	x	x	x	0.48	0.63	1.18	27.92
Traveller Accommodation	x	x	x	x	0.37	0.68	1.27	22.24
Food Services and Drinking Places	0.29	0.44	1	28.30	0.33	0.53	1.19	29.81

2001								
	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	Employment (per million $)	Wages and Salaries	Total GDP	Output	Employment (per million $)
Universities	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.32	0.11	1	16.68	0.39	0.24	1.27	18.83
Other Administrative and Support Services	0.44	0.58	1	10.99	0.49	0.68	1.19	12.34
All other Transit and Ground Passenger	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Air Transport	x	x	x	x	0.36	0.46	1.31	9.33
Support for Transport	x	x	x	x	0.52	0.68	1.19	10.30
Traveller Accommodation	x	x	x	x	0.40	0.67	1.27	17.42
Food Services and Drinking Places	0.30	0.42	1	22.05	0.35	0.53	1.20	23.56

Table C.2 (Continued) Nunavut Territory Statistics Canada Multipliers

2002

	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	Employment (per million $)	Wages and Salaries	Total GDP	Output	Employment (per million $)
Universities	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.39	0.44	1	9.65	0.44	0.52	1.17	11.20
Other Administrative and Support Services	0.47	0.59	1	14.53	0.52	0.69	1.19	16.18
All other Transit and Ground Passenger	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Air Transport	x	x	x	x	0.35	0.47	1.36	9.70
Support for Transport	x	x	x	x	0.45	0.61	1.27	9.51
Traveller Accommodation	x	x	x	x	0.40	0.65	1.25	17.39
Food Services and Drinking Places	0.30	0.42	1	22.67	0.36	0.52	1.21	24.36

2003

	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	Employment (per million $)	Wages and Salaries	Total GDP	Output	Employment (per million $)
Universities	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.64	0.28	1	12.70	0.72	0.42	1.27	14.78
Other Administrative and Support Services	0.47	0.62	1	12.91	0.53	0.74	1.24	14.62
All other Transit and Ground Passenger	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Air Transport	x	x	x	x	0.39	0.47	1.40	10.33
Support for Transport	x	x	x	x	0.47	0.66	1.27	9.40
Traveller Accommodation	x	x	x	x	0.41	0.67	1.29	15.28
Food Services and Drinking Places	0.30	0.41	1	22.76	0.36	0.52	1.23	24.42

Table C.2 (Continued) Nunavut Territory Statistics Canada Multipliers

2004								
	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	Employment (per million $)	Wages and Salaries	Total GDP	Output	Employment (per million $)
Universities	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.63	0.64	1	8.00	0.69	0.75	1.20	9.29
Other Administrative and Support Services	0.53	0.64	1	9.86	0.61	0.77	1.24	11.34
All other Transit and Ground Passenger	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Air Transport	x	x	x	x	0.35	0.43	1.37	6.44
Support for Transport	x	x	x	x	0.59	0.78	1.16	8.31
Traveller Accommodation	x	x	x	x	0.42	0.67	1.29	8.40
Food Services and Drinking Places	0.32	0.42	1	14.23	0.38	0.53	1.24	15.61

2005								
	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	# of Jobs (per million $)	Wages and Salaries	Total GDP	Output	# of Jobs (per million $)
Universities	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.63	0.53	1	16.02	0.71	0.66	1.23	16.38
Other Administrative and Support Services	0.52	0.61	1	12.90	0.59	0.74	1.24	11.55
All other Transit and Ground Passenger	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Air Transport	x	x	x	x	0.24	0.39	1.24	4.76
Support for Transport	x	x	x	x	0.47	0.72	1.20	8.64
Traveller Accommodation	x	x	x	x	0.39	0.66	1.29	9.25
Food Services and Drinking Places	0.27	0.40	1	10.84	0.33	0.52	1.23	10.41

Table C.2 (Continued) Nunavut Territory Statistics Canada Multipliers

2006								
	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	# of Jobs (per million $)	Wages and Salaries	Total GDP	Output	# of Jobs (per million $)
Universities	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.64	0.47	1	15.20	0.73	0.61	1.26	17.05
Other Administrative and Support Services	0.56	0.65	1	10.22	0.63	0.77	1.23	11.69
All other Transit and Ground Passenger	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Air Transport	x	x	x	x	0.25	0.41	1.25	4.58
Support for Transport	x	x	x	x	0.46	0.74	1.17	8.06
Traveller Accommodation	x	x	x	x	0.41	0.66	1.28	10.89
Food Services and Drinking Places	0.27	0.41	1	9.97	0.41	0.66	1.28	10.89

2007								
	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	# of Jobs (per million $)	Wages and Salaries	Total GDP	Output	# of Jobs (per million $)
Universities	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.66	0.54	1	15.35	0.74	0.67	1.23	16.98
Other Administrative and Support Services	0.64	0.71	1	10.57	0.70	0.82	1.19	11.73
All other Transit and Ground Passenger	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Air Transport	x	x	x	x	0.25	0.40	1.22	4.44
Support for Transport	x	x	x	x	0.47	0.69	1.18	8.14
Traveller Accommodation	x	x	x	x	0.39	0.65	1.27	10.69
Food Services and Drinking Places	0.29	0.41	1	11.13	0.35	0.52	1.22	12.29

Table C.3 Yukon Territory Statistics Canada Multipliers

2000								
	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	Employment (per million $)	Wages and Salaries	Total GDP	Output	Employment (per million $)
Universities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.41	0.60	1.00	22.85	0.46	0.70	1.18	24.81
Other Administrative and Support Services	0.28	0.42	1.00	11.98	0.35	0.57	1.26	14.32
All other Transit and Ground Passenger	0.43	0.69	1.00	11.37	0.49	0.80	1.18	13.27
Air Transport	x	x	x	x	0.30	0.49	1.29	8.17
Support for Transport	x	x	x	x	0.32	0.56	1.30	8.72
Traveller Accommodation	x	x	x	x	0.43	0.73	1.24	20.12
Food Services and Drinking Places	0.33	0.45	1.00	21.49	0.39	0.58	1.23	23.73

2001								
	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	Employment (per million $)	Wages and Salaries	Total GDP	Output	Employment (per million $)
Universities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.39	0.57	1.00	14.93	0.45	0.70	1.23	16.62
Other Administrative and Support Services	0.26	0.50	1.00	8.76	0.32	0.62	1.23	10.39
All other Transit and Ground Passenger	0.51	0.66	1.00	10.58	0.57	0.77	1.20	12.17
Air Transport	x	x	x	x	0.34	0.47	1.32	7.92
Support for Transport	x	x	x	x	0.35	0.64	1.32	8.33
Traveller Accommodation	x	x	x	x	0.40	0.68	1.29	16.67
Food Services and Drinking Places	0.32	0.47	1.00	22.59	0.38	0.60	1.24	24.27

Table C.3 (Continued) Yukon Territory Statistics Canada Multipliers

2002

	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	Employment (per million $)	Wages and Salaries	Total GDP	Output	Employment (per million $)
Universities	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.40	0.58	1	16.03	0.45	0.71	1.23	17.85
Other Administrative and Support Services	0.27	0.51	1	9.82	0.35	0.76	1.46	12.37
All other Transit and Ground Passenger	0.43	0.67	1	9.19	0.49	0.77	1.18	10.94
Air Transport	x	x	x	x	0.32	0.46	1.30	8.02
Support for Transport	x	x	x	x	0.31	0.54	1.34	9.57
Traveller Accommodation	x	x	x	x	0.41	0.70	1.29	18.48
Food Services and Drinking Places	0.33	0.49	1	23.12	0.39	0.62	1.23	25.03

2003

	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	Employment (per million $)	Wages and Salaries	Total GDP	Output	Employment (per million $)
Universities	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.37	0.55	1	12.87	0.44	0.70	1.26	14.89
Other Administrative and Support Services	0.46	0.71	1	15.53	0.51	0.85	1.23	17.20
All other Transit and Ground Passenger	0.45	0.67	1	10.58	0.51	0.77	1.18	12.28
Air Transport	x	x	x	x	0.33	0.46	1.32	8.00
Support for Transport	x	x	x	x	0.25	0.49	1.31	7.55
Traveller Accommodation	x	x	x	x	0.40	0.70	1.27	17.33
Food Services and Drinking Places	0.33	0.49	1	24.81	0.39	0.62	1.23	26.68

Table C.3 (Continued) Yukon Territory Statistics Canada Multipliers

2004								
	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	Employment (per million $)	Wages and Salaries	Total GDP	Output	Employment (per million $)
Universities	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	x	x	x	x	0.39	0.66	1.24	14.31
Other Administrative and Support Services	0.39	0.73	1	14.97	0.44	0.82	1.17	16.40
All other Transit and Ground Passenger	0.44	0.69	1	11.46	0.50	0.79	1.19	13.17
Air Transport	x	x	x	x	0.31	0.42	1.33	8.17
Support for Transport	x	x	x	x	0.30	0.56	1.37	9.72
Traveller Accommodation	x	x	x	x	0.42	0.72	1.25	17.89
Food Services and Drinking Places	0.34	0.49	1	21.92	0.39	0.60	1.20	23.72

2005								
	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	# of Jobs (per million $)	Wages and Salaries	Total GDP	Output	# of Jobs (per million $)
Universities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.31	0.47	1.00	13.84	0.38	0.59	1.24	15.97
Other Administrative and Support Services	0.55	0.73	1.00	16.81	0.59	0.82	1.17	18.14
All other Transit and Ground Passenger	0.46	0.73	1.00	3.03	0.50	0.81	1.13	4.00
Air Transport	x	x	x	x	0.23	0.42	1.27	5.34
Support for Transport	x	x	x	x	0.27	0.58	1.34	5.45
Traveller Accommodation	x	x	x	x	0.41	0.71	1.23	16.37
Food Services and Drinking Places	0.34	0.48	1.00	20.92	0.39	0.59	1.20	22.64

Table C.3 (Continued) Yukon Territory Statistics Canada Multipliers

2006

	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	# of Jobs (per million $)	Wages and Salaries	Total GDP	Output	# of Jobs (per million $)
Universities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	x	x	x	x	0.38	0.59	1.26	16.65
Other Administrative and Support Services	0.63	0.77	1.00	18.20	0.67	0.85	1.15	19.35
All other Transit and Ground Passenger	0.27	0.76	1.00	0.93	0.30	0.82	1.11	1.77
Air Transport	x	x	x	x	0.23	0.44	1.29	5.34
Support for Transport	x	x	x	x	0.28	0.57	1.35	5.34
Traveller Accommodation	x	x	x	x	0.42	0.72	1.24	15.86
Food Services and Drinking Places	0.34	0.49	1.00	18.61	0.39	0.60	1.19	20.20

2007

	Direct effect				Direct and indirect effects			
	Wages and Salaries	Total GDP	Output	# of Jobs (per million $)	Wages and Salaries	Total GDP	Output	# of Jobs (per million $)
Universities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Professional, Scientific and Technical Services	0.31	0.52	1.00	12.21	0.37	0.64	1.21	13.95
Other Administrative and Support Services	0.67	0.79	1.00	16.33	0.70	0.86	1.13	17.27
All other Transit and Ground Passenger	0.29	0.75	1.00	5.21	0.33	0.82	1.13	6.16
Air Transport	x	x	x	x	0.25	0.42	1.26	5.34
Support for Transport	x	x	x	x	0.29	0.56	1.32	5.24
Traveller Accommodation	x	x	x	x	0.42	0.72	1.23	14.12
Food Services and Drinking Places	0.34	0.50	1.00	16.21	0.39	0.60	1.18	17.69

APPENDIX D: TOTAL PUBLIC RESEARCH ECONOMIC OUTPUT BREAKDWON BY ACTIVITY FOR EACH TERRITORY 2000-2009

Table D.1 Northwest Territories Total Public Research Output Breakdown by Activity (Thousands)

		Northwest Territory								
	Output	Univer-sities	Other Professional/ Scientific/ Technical Services	Other Admin/ Support Services	All other Transit and Ground Passenger	Air Transport	Support Activities for Transport	Traveller Accomm-odation	Food Services and Drinking Places	Total
2000	Direct	0.00	51.49	0.00	0.00	x	x	x	69.26	120.75
	Indirect	0.00	9.22	0.00	0.00	x	x	x	16.14	25.36
	Total	0.00	60.71	0.00	0.00	0.00	0.00	0.00	85.40	146.11
2001	Direct	0.00	149.24	28.16	157.94	x	x	x	0.00	335.35
	Indirect	0.00	39.34	4.75	45.63	x	x	x	0.00	89.72
	Total	0.00	188.58	32.91	203.57	102.51	0.00	423.61	0.00	951.19
2002	Direct	0.00	24.48	3.52	38.67	x	x	x	7.10	73.77
	Indirect	0.00	5.70	0.59	16.10	x	x	x	1.17	23.56
	Total	0.00	30.17	4.11	54.78	54.02	0.00	39.50	8.28	190.86
2003	Direct	0.00	53.50	4.13	41.48	x	x	x	10.31	109.42
	Indirect	0.00	10.02	0.53	11.73	x	x	x	1.73	24.01
	Total	0.00	63.52	4.66	53.20	32.15	0.00	7.46	12.04	173.04
2004	Direct	0.00	30.38	2.60	23.30	x	x	x	12.51	68.79
	Indirect	0.00	6.05	0.35	3.90	x	x	x	1.93	12.23
	Total	0.00	36.43	2.95	27.20	20.93	2.28	8.99	14.45	113.23
2005	Direct	0.00	16.00	3.24	54.92	x	x	x	29.07	103.23
	Indirect	0.00	3.28	0.41	6.75	x	x	x	4.54	14.98
	Total	0.00	19.29	3.65	61.66	31.88	0.00	32.84	33.61	182.93
2006	Direct	0.00	86.52	2.65	22.00	x	x	x	34.62	145.78
	Indirect	0.00	17.65	0.31	2.67	x	x	x	5.47	26.11
	Total	0.00	104.17	2.96	24.67	62.33	0.93	33.83	40.10	268.99
2007	Direct	0.00	338.40	26.86	152.84	x	x	x	129.63	647.73
	Indirect	0.00	65.47	2.79	12.06	x	x	x	19.01	99.33
	Total	0.00	403.87	29.65	164.90	1,910.80	3.88	267.82	148.64	2,929.56
2008	Direct	0.00	358.69	24.78	121.19	x	x	x	128.69	633.35
	Indirect	0.00	69.39	2.58	9.56	x	x	x	18.87	100.41
	Total	0.00	428.08	27.36	130.75	1,754.64	3.62	261.69	147.57	2,753.70
2009	Direct	0.00	177.98	30.30	125.08	x	x	x	135.66	469.02
	Indirect	0.00	34.43	3.15	9.87	x	x	x	19.90	67.35
	Total	0.00	212.42	33.45	134.95	2,068.03	4.41	253.73	155.56	2,862.55

Table D.2 Nunavut Territory Total Public Research Output Breakdown by Activity (Thousands)

		Nunavut								
	Output	Univer-sities	Other Professional, Scientific, Technical Services	Other Admin and Support Services	All other Transit and Ground Passenger	Air Transport	Support Activities for Transport	Traveller Accommo dation	Food Services and Drinking Places	Total
2000	Direct	0.00	211.64	0.00	x	x	x	x	6.10	217.74
	Indirect	0.00	41.89	0.00	x	x	x	x	1.18	43.07
	Total	0.00	253.53	0.00	x	x	x	x	7.28	260.81
2001	Direct	0.00	41.86	0.00	0.00	x	x	x	7.88	49.74
	Indirect	0.00	11.13	0.00	0.00	x	x	x	1.61	12.74
	Total	0.00	52.99	0.00	0.00	0.00	0.00	47.12	9.49	109.60
2002	Direct	0.00	159.79	5.86	0.00	0.00	0.00	111.72	23.07	300.44
	Indirect	0.00	25.99	0.43	0.00	0.00	0.00	12.05	8.65	47.11
	Total	0.00	185.78	6.29	0.00	0.00	0.00	123.76	31.72	347.55
2003	Direct	0.00	103.63	0.00	0.00	x	x	x	2.53	106.16
	Indirect	0.00	28.43	0.00	0.00	x	x	x	0.57	29.00
	Total	0.00	132.06	0.00	0.00	0.00	0.00	47.20	3.10	182.37
2004	Direct	0.00	93.19	9.53	0.00	x	x	x	73.70	176.42
	Indirect	0.00	18.56	2.27	0.00	x	x	x	17.36	38.19
	Total	0.00	111.75	11.80	0.00	0.00	0.00	96.15	91.06	310.75
2005	Direct	0.00	95.26	70.63	0.00	x	x	x	60.47	226.37
	Indirect	0.00	22.31	16.72	0.00	x	x	x	14.12	53.15
	Total	0.00	117.58	87.35	0.00	0.00	0.00	185.30	74.59	464.82
2006	Direct	0.00	238.47	89.57	0.00	x	x	x	118.00	446.03
	Indirect	0.00	62.19	20.60	0.00	x	x	x	33.59	116.38
	Total	0.00	300.66	110.16	0.00	31.32	0.67	133.85	151.59	728.25
2007	Direct	0.00	2,194.60	59.35	0.00	x	x	x	48.36	2,302.30
	Indirect	0.00	500.24	11.36	0.00	x	x	x	10.42	522.02
	Total	0.00	2,694.84	70.70	0.00	30.80	1.13	65.09	58.78	2,921.34
2008	Direct	0.00	2,219.10	47.57	0.00	x	x	x	85.36	2,352.03
	Indirect	0.00	505.82	9.10	0.00	x	x	x	18.40	533.33
	Total	0.00	2,724.92	56.67	0.00	43.09	0.62	95.83	103.76	3,024.89
2009	Direct	0.00	430.40	0.00	0.00	x	x	x	42.14	472.54
	Indirect	0.00	98.11	0.00	0.00	x	x	x	9.08	107.19
	Total	0.00	528.51	0.00	0.00	1,118.77	2.00	68.25	51.22	1,768.75

Table D.3 Yukon Territory Total Public Research Output Breakdown by Activity (Thousands)

		Yukon								
	Output	Univer-sities	Other Professional, Scientific, Technical Services	Other Admin and Support Services	All other Transit and Ground Passenger	Air Transport	Support Activities for Transport	Traveller Accomm-odation	Food Services and Drinking Places	Total
2000	Direct	0.00	0.00	0.00	5.03	x	x	x	30.23	35.26
	Indirect	0.00	0.00	0.00	0.93	x	x	x	7.05	7.97
	Total	0.00	0.00	0.00	5.96	0.00	16.40	124.66	37.28	184.29
2001	Direct	0.00	0.00	0.00	0.00	x	x	x	0.00	0.00
	Indirect	0.00	0.00	0.00	0.00	x	x	x	0.00	0.00
	Total	0.00	0.00	0.00	0.00	0.00	0.00	85.55	0.00	85.55
2002	Direct	0.00	18.80	3.42	83.75	x	x	x	23.11	129.07
	Indirect	0.00	4.34	1.56	15.17	x	x	x	5.42	26.49
	Total	0.00	23.14	4.98	98.92	55.79	1.53	66.15	28.53	279.04
2003	Direct	0.00	172.05	4.10	67.00	x	x	x	8.79	251.94
	Indirect	0.00	44.33	0.96	12.29	x	x	x	1.99	59.56
	Total	0.00	216.38	5.05	79.28	212.34	0.00	97.98	10.78	621.82
2004	Direct	0.00	x	2.62	19.75	x	x	x	21.65	44.02
	Indirect	0.00	x	0.44	3.68	x	x	x	4.33	8.45
	Total	0.00	9.77	3.06	23.43	123.96	5.40	75.20	25.97	266.80
2005	Direct	0.00	9.57	3.19	77.58	x	x	x	32.28	122.62
	Indirect	0.00	2.32	0.53	10.09	x	x	x	6.38	19.31
	Total	0.00	11.89	3.72	87.67	179.46	1.02	47.69	38.66	370.09
2006	Direct	0.00	x	2.62	39.20	x	x	x	88.13	129.95
	Indirect	0.00	x	0.38	4.33	x	x	x	16.96	21.67
	Total	0.00	39.62	3.00	43.53	214.55	5.21	58.31	105.09	469.30
2007	Direct	0.00	178.66	0.00	51.71	x	x	x	109.19	339.56
	Indirect	0.00	38.35	0.00	6.82	x	x	x	19.93	65.10
	Total	0.00	217.01	0.00	58.54	271.66	11.33	92.08	129.12	779.73
2008	Direct	0.00	135.23	0.00	51.35	x	x	x	130.85	317.43
	Indirect	0.00	29.02	0.00	6.78	x	x	x	23.89	59.69
	Total	0.00	164.26	0.00	58.13	199.59	10.74	167.14	154.73	754.58
2009	Direct	0.00	48.67	12.17	55.64	x	x	x	125.59	242.06
	Indirect	0.00	10.45	1.59	7.34	x	x	x	22.93	42.30
	Total	0.00	59.11	13.76	62.98	1,574.68	13.98	189.48	148.51	2,062.50

APPENDIX E: TOTAL PUBLIC RESEARCH INCOME IMPACTS BY ACTIVITY FOR EACH TERRITORY 2000-2009

Table E.1 Northwest Territories Total Public Research Income Impacts Breakdown by Activity (Thousands)

		NWT								
		Univer-sities	Other Professional/ Scientific/ Technical Services	Other Admin/ Support Services	All other Transit and Ground Passenger	Air Transport	Support Activities for Transport	Traveller Accommodation	Food Services and Drinking Places	Total
2000	Direct	0.00	18.08	0.00	0.00	x	x	x	21.42	
	Total	0.00	23.80	0.00	0.00	0.00	0.00	0.00	26.86	50.66
2001	Direct	0.00	53.17	14.81	38.79	x	x	x	0.00	
	Total	0.00	63.05	15.91	49.79	28.39	0.00	130.96	0.00	288.10
2002	Direct	0.00	9.80	1.68	17.97	x	x	x	2.22	
	Total	0.00	11.37	1.84	22.92	14.68	0.00	12.62	2.53	65.97
2003	Direct	0.00	21.62	2.70	15.12	x	x	x	3.15	
	Total	0.00	24.46	2.83	19.29	7.16	0.00	2.42	3.62	59.78
2004	Direct	0.00	12.25	1.70	7.27	x	x	x	3.87	
	Total	0.00	13.96	1.77	8.21	3.96	0.67	2.80	4.35	35.72
2005	Direct	0.00	6.89	2.14	12.95	x	x	x	9.41	
	Total	0.00	7.76	2.23	14.67	5.02	0.00	10.21	10.53	50.42
2006	Direct	0.00	37.66	1.90	4.45	x	x	x	10.47	
	Total	0.00	42.07	1.98	5.11	9.78	0.27	10.24	11.85	81.30
2007	Direct	0.00	149.03	20.07	32.93	x	x	x	42.97	
	Total	0.00	165.67	20.74	36.08	321.75	1.14	90.97	47.99	684.33
2008	Direct	0.00	157.97	18.51	26.11	x	x	x	42.66	
	Total	0.00	175.60	19.13	28.61	295.46	1.07	88.88	47.64	656.38
2009	Direct	0.00	78.39	22.63	26.95	x	x	x	44.97	
	Total	0.00	87.13	23.39	29.53	348.23	1.30	86.18	50.22	625.98

x - multipliers were not available due to confidentiality reasons

Table E.2 Nunavut Territory Total Public Research Income Impacts Breakdown by Activity (Thousands)

		NU								
		Univer-sities	Other Professional/ Scientific/ Technical Services	Other Admin/ Support Services	All other Transit and Ground Passenger	Air Transport	Support Activities for Transport	Traveller Accommodation	Food Services and Drinking Places	Total
2000	Direct	0.00	70.91	0.00	0.00	x	x	x	1.76	
	Total	0.00	81.37	0.00	1.69	0.00	0.00	1.68	2.01	86.76
2001	Direct	0.00	13.54	0.00	0.00	x	x	x	2.37	
	Total	0.00	16.52	0.00	0.00	0.00	0.00	14.66	2.75	33.94
2002	Direct	0.00	52.99	2.30	0.00	x	x	x	5.81	
	Total	0.00	59.86	2.56	0.00	0.00	0.00	35.43	6.85	104.71
2003	Direct	0.00	66.44	0.00	0.00	x	x	x	0.75	
	Total	0.00	75.13	0.00	0.00	0.00	0.00	14.88	0.91	90.92
2004	Direct	0.00	58.28	5.08	0.00	x	x	x	23.38	
	Total	0.00	64.74	5.77	0.00	0.00	0.00	31.42	28.22	130.15
2005	Direct	0.00	60.15	36.70	0.00	x	x	x	16.27	
	Total	0.00	67.60	41.69	0.00	0.00	0.00	56.63	19.94	185.87
2006	Direct	0.00	152.24	50.23	0.00	x	x	x	31.82	
	Total	0.00	173.46	56.54	0.00	6.25	0.27	42.26	47.86	326.64
2007	Direct	0.00	1449.36	38.07	0.00	x	x	x	14.16	
	Total	0.00	1634.37	41.68	0.00	6.25	0.45	20.03	17.03	1719.81
2008	Direct	0.00	1465.53	30.51	0.00	x	x	x	24.99	
	Total	0.00	1465.53	30.51	0.00	8.75	0.25	29.49	30.05	1564.58
2009	Direct	0.00	284.25	0.00	0.00	x	x	x	12.34	
	Total	0.00	320.53	0.00	0.00	227.09	0.79	21.00	14.84	584.26

x - multipliers were not available due to confidentiality reasons

Table E.3 Yukon Territory Total Public Research Income Impacts Breakdown by Activity (Thousands)

		Yukon								
		Univer-sities	Other Professional/ Scientific/ Technical Services	Other Admin/ Support Services	All other Transit and Ground Passenger	Air Transport	Support Activities for Transport	Traveller Accommodation	Food Services and Drinking Places	Total
2000	Direct	0.00	0.00	0.00	2.15	N/A	N/A	N/A	9.93	
	Total	0.00	0.00	0.00	2.45	0.00	3.99	43.03	11.73	61.20
2001	Direct	0.00	0.00	0.00	0.00	N/A	N/A	N/A	0.00	
	Total	0.00	0.00	0.00	0.00	0.00	0.00	26.51	0.00	26.51
2002	Direct	0.00	7.43	0.94	36.41	N/A	N/A	N/A	7.73	
	Total	0.00	8.48	1.21	40.97	13.51	0.35	20.83	8.93	94.29
2003	Direct	0.00	63.16	1.89	30.29	N/A	N/A	N/A	2.93	
	Total	0.00	74.94	2.11	34.04	53.19	0.00	30.73	3.39	198.40
2004	Direct	0.00	0.00	1.02	8.79	N/A	N/A	N/A	7.36	
	Total	0.00	3.06	1.14	9.93	28.85	1.18	25.45	8.47	78.08
2005	Direct	0.00	3.01	1.75	35.52	N/A	N/A	N/A	11.00	
	Total	0.00	3.66	1.89	38.64	32.24	0.20	15.77	12.59	104.99
2006	Direct	0.00	0.00	1.65	10.52	N/A	N/A	N/A	29.75	
	Total	0.00	12.09	1.75	11.71	37.72	1.09	19.85	34.07	118.29
2007	Direct	0.00	54.65	0.00	15.11	N/A	N/A	N/A	37.06	
	Total	0.00	66.06	0.00	17.01	54.75	2.51	31.23	42.42	213.98
2008	Direct	0.00	41.37	0.00	15.00	N/A	N/A	N/A	44.42	
	Total	0.00	50.00	0.00	16.89	40.22	2.38	56.69	50.84	217.02
2009	Direct	0.00	14.89	8.11	16.26	N/A	N/A	N/A	42.63	
	Total	0.00	18.00	8.56	18.30	317.35	3.10	64.25	48.79	478.35

x - multipliers were not available due to confidentiality reasons

APPENDIX F: TOTAL PUBLIC RESEARCH GDP IMPACTS BY ACTIVITY FOR EACH TERRITORY 2000-2009

Table F.1 Northwest Territories Total Public Research GDP Impacts Breakdown by Activity (Thousands)

		NWT								
		Universities	Other Professional/ Scientific/ Technical Services	Other Admin/ Support Services	All other Transit and Ground Passenger	Air Transport	Support Activities for Transport	Traveller Accommodation	Food Services and Drinking Places	Total
2000	Direct	0.00	18.65	0.00	0.00	x	x	x	33.28	51.93
	Total	0.00	35.88	0.00	0.00	0.00	0.00	0.00	40.19	76.07
2001	Direct	0.00	57.43	19.56	89.23	x	x	x	0.00	166.23
	Total	0.00	76.98	22.11	108.04	36.47	0.00	234.82	0.00	478.43
2002	Direct	0.00	11.34	2.28	18.40	x	x	x	3.61	35.62
	Total	0.00	14.37	2.60	26.39	19.36	0.00	23.34	4.21	90.28
2003	Direct	0.00	28.30	3.24	23.53	x	x	x	5.17	60.25
	Total	0.00	33.90	3.54	30.10	9.17	0.00	4.53	6.07	87.30
2004	Direct	0.00	16.93	2.04	14.78	x	x	x	6.26	40.00
	Total	0.00	20.31	2.23	16.94	5.54	1.16	5.33	7.26	58.77
2005	Direct	0.00	9.48	2.57	40.68	x	x	x	14.57	67.29
	Total	0.00	11.27	2.79	44.22	9.68	0.00	19.52	16.95	104.44
2006	Direct	0.00	51.14	2.13	16.19	x	x	x	16.75	86.21
	Total	0.00	60.53	2.30	17.55	19.26	0.46	19.39	19.63	139.12
2007	Direct	0.00	200.23	22.20	120.16	x	x	x	64.86	407.45
	Total	0.00	234.96	23.69	126.43	588.67	1.91	160.63	74.92	1,211.21
2008	Direct	0.00	212.23	20.48	95.28	x	x	x	64.39	392.38
	Total	0.00	249.05	21.86	100.25	540.55	1.78	156.95	74.37	1,144.82
2009	Direct	0.00	105.31	25.04	98.34	x	x	x	67.87	296.56
	Total	0.00	123.58	26.72	103.47	637.10	2.18	152.18	78.40	1,123.63

x - multipliers were not available due to confidentiality reasons

Table F.2 Nunavut Territory Total Public Research GDP Impacts Breakdown by Activity (Thousands)

		Nunavut								
		Universities	Other Professional/ Scientific/ Technical Services	Other Admin/ Support Services	All other Transit and Ground Passenger	Air Transport	Support Activities for Transport	Traveller Accommodation	Food Services and Drinking Places	Total
2000	Direct	0.00	94.37	0.00	0.00	x	x	x	2.66	97.03
	Total	0.00	115.68	0.00	3.59	0.00	0.00	3.08	3.22	125.57
2001	Direct	0.00	4.49	0.00	0.00	x	x	x	3.34	7.83
	Total	0.00	10.19	0.00	0.00	0.00	0.00	24.83	4.17	39.18
2002	Direct	0.00	52.99	2.30	0.00	x	x	x	5.81	61.10
	Total	0.00	71.30	3.40	0.00	0.00	0.00	57.89	10.00	142.59
2003	Direct	0.00	28.96	0.00	0.00	x	x	x	1.04	30.00
	Total	0.00	43.79	0.00	0.00	0.00	0.00	24.25	1.32	69.36
2004	Direct	0.00	60.04	6.08	0.00	x	x	x	30.64	96.76
	Total	0.00	70.30	7.30	0.00	0.00	0.00	49.86	39.15	166.60
2005	Direct	0.00	50.55	43.05	0.00	x	x	x	24.33	117.93
	Total	0.00	62.55	52.10	0.00	0.00	0.00	94.80	31.16	240.59
2006	Direct	0.00	112.54	58.04	0.00	x	x	x	48.26	218.84
	Total	0.00	144.90	69.25	0.00	10.38	0.43	69.02	78.17	372.16
2007	Direct	0.00	1,194.43	42.14	0.00	x	x	x	19.90	1,256.47
	Total	0.00	1,469.07	48.48	0.00	10.00	0.66	33.48	25.17	1,586.85
2008	Direct	0.00	1,207.77	33.78	0.00	x	x	x	35.12	1,276.67
	Total	0.00	1,485.47	38.85	0.00	13.99	0.36	49.30	44.43	1,632.40
2009	Direct	0.00	234.25	0.00	0.00	x	x	x	17.34	251.59
	Total	0.00	288.11	0.00	0.00	363.15	1.17	35.11	21.93	709.48

x - multipliers were not available due to confidentiality reasons

Table F.3 Yukon Territory Total Public Research GDP Impacts Breakdown by Activity (Thousands)

		Yukon								
		Universities	Other Professional/ Scientific/ Technical Services	Other Admin/ Support Services	All other Transit and Ground Passenger	Air Transport	Support Activities for Transport	Traveller Accommodation	Food Services and Drinking Places	Total
2000	Direct	0.00	0.00	0.00	3.49	x	x	x	13.56	17.05
	Total	0.00	0.00	0.00	4.04	0.00	7.05	74.01	17.54	102.64
2001	Direct	0.00	0.00	0.00	0.00	x	x	x	0.00	0.00
	Total	0.00	0.00	0.00	0.00	0.00	0.00	45.24	0.00	45.24
2002	Direct	0.00	10.87	1.74	56.53	x	x	x	11.31	80.44
	Total	0.00	13.28	2.60	64.85	19.67	0.61	36.09	14.21	151.31
2003	Direct	0.00	94.82	2.92	44.73	x	x	x	4.34	146.81
	Total	0.00	120.20	3.47	51.56	74.67	0.00	53.87	5.41	309.17
2004	Direct	0.00	0.00	1.90	13.56	x	x	x	10.64	26.10
	Total	0.00	5.18	2.16	15.70	39.07	2.21	43.10	13.09	120.52
2005	Direct	0.00	4.48	2.33	56.83	x	x	x	15.65	79.29
	Total	0.00	5.69	2.62	62.69	58.89	0.44	27.28	19.13	176.74
2006	Direct	0.00	0.00	2.02	29.77	x	x	x	43.39	75.18
	Total	0.00	18.58	2.22	32.25	73.32	2.18	33.74	52.69	214.99
2007	Direct	0.00	93.35	0.00	38.53	x	x	x	54.16	186.04
	Total	0.00	114.10	0.00	42.46	90.59	4.82	53.61	65.23	370.80
2008	Direct	0.00	70.66	0.00	38.26	x	x	x	64.90	173.82
	Total	0.00	86.37	0.00	42.16	66.56	4.56	97.31	78.17	375.13
2009	Direct	0.00	25.43	9.62	41.46	x	x	x	62.29	138.79
	Total	0.00	31.08	10.47	45.68	525.10	5.94	110.30	75.03	803.61

x - multipliers were not available due to confidentiality reasons

APPENDIX G: TOTAL PUBLIC RESEARCH EMPLOYMENT IMPACTS BY ACTIVITY FOR EACH TERRITORY 2000-2009

Table G.1 Northwest Territories Total Public Research Employment Impacts Breakdown by Activity (# of jobs)

		NWT								
		Univer-sities	Other Professional/ Scientific/ Technical Services	Other Admin/ Support Services	All other Transit and Ground Passenger	Air Transport	Support Activities for Transport	Traveller Accommodation	Food Services and Drinking Places	Total
2000	Direct	0.00	1.05	0.00	0.00	x	x	x	1.37	2.42
	Total	0.00	1.28	0.00	0.00	0.00	0.00	0.00	1.64	2.92
2001	Direct	0.00	2.20	0.43	1.16	x	x	x	0.00	3.79
	Total	0.00	2.46	0.46	1.40	0.61	0.00	5.36	0.00	10.30
2002	Direct	0.00	0.34	0.05	0.71	x	x	x	0.14	1.24
	Total	0.00	0.39	0.05	0.79	0.31	0.00	0.52	0.15	2.22
2003	Direct	0.00	0.70	0.06	0.54	x	x	x	0.19	1.49
	Total	0.00	0.78	0.06	0.61	0.14	0.00	0.09	0.20	1.88
2004	Direct	0.00	0.37	0.05	0.33	x	x	x	0.23	0.97
	Total	0.00	0.41	0.05	0.35	0.08	0.01	0.09	0.24	1.24
2005	Direct	0.00	0.20	0.04	0.51	x	x	x	0.45	1.20
	Total	0.00	0.22	0.04	0.54	0.09	0.00	0.22	0.48	1.59
2006	Direct	0.00	1.04	0.04	0.20	x	x	x	0.44	1.72
	Total	0.00	1.12	0.04	0.21	0.17	0.00	0.22	0.47	2.25
2007	Direct	0.00	3.81	0.30	1.80	x	x	x	1.51	7.41
	Total	0.00	4.10	0.31	1.85	5.05	0.02	1.87	1.60	14.80
2008	Direct	0.00	4.03	0.28	1.43	x	x	x	1.50	7.23
	Total	0.00	4.35	0.29	1.47	4.64	0.01	1.83	1.59	14.17
2009	Direct	0.00	2.00	0.34	1.47	x	x	x	1.58	5.39
	Total	0.00	2.16	0.35	1.52	5.46	0.02	1.77	1.68	12.96

x - multipliers were not available due to confidentiality reasons

Table G.2 Nunavut Territory Total Public Research Employment Impacts Breakdown by Activity (# of jobs)

		Nunavut								
		Univer-sities	Other Professional/ Scientific/ Technical Services	Other Admin/ Support Services	All other Transit and Ground Passenger	Air Transport	Support Activities for Transport	Traveller Accommodation	Food Services and Drinking Places	Total
2000	Direct	0.00	11.69	0.00	0.08	x	x	x	0.17	11.86
	Total	0.00	12.10	0.00	0.08	0.00	0.00	0.10	0.18	12.46
2001	Direct	0.00	0.70	0.00	0.00	x	x	x	0.17	0.87
	Total	0.00	0.79	0.00	0.00	0.00	0.00	0.65	0.19	1.62
2002	Direct	0.00	1.32	0.07	0.00	x	x	x	0.43	1.82
	Total	0.00	1.53	0.08	0.00	0.00	0.00	1.55	0.47	3.63
2003	Direct	0.00	1.32	0.00	0.00	x	x	x	0.06	1.37
	Total	0.00	1.53	0.00	0.00	0.00	0.00	0.56	0.06	2.15
2004	Direct	0.00	0.75	0.09	0.00	x	x	x	1.05	1.89
	Total	0.00	0.87	0.11	0.00	0.00	0.00	0.62	1.15	2.75
2005	Direct	0.00	1.53	0.91	0.00	x	x	x	0.66	3.09
	Total	0.00	1.69	1.02	0.00	0.00	0.00	1.66	0.74	5.11
2006	Direct	0.00	3.62	0.92	0.00	x	x	x	1.18	5.72
	Total	0.00	4.07	1.05	0.00	0.11	0.00	1.14	1.29	7.65
2007	Direct	0.00	33.70	0.63	0.00	x	x	x	0.54	34.86
	Total	0.00	37.27	0.70	0.00	0.11	0.01	0.55	0.59	39.23
2008	Direct	0.00	34.07	0.50	0.00	x	x	x	0.95	0.90
	Total	0.00	37.69	0.56	0.00	0.16	0.00	0.81	1.05	40.26
2009	Direct	0.00	6.61	0.00	0.00	x	x	x	0.47	0.18
	Total	0.00	7.31	0.00	0.00	4.07	0.01	0.57	0.52	12.48

x - multipliers were not available due to confidentiality reasons

Table G.3 Yukon Territory Total Public Research Employment Impacts Breakdown by Activity (# of jobs)

		Yukon								
		Univer-sities	Other Professional/ Scientific/ Technical Services	Other Admin/ Support Services	All other Transit and Ground Passenger	Air Transport	Support Activities for Transport	Traveller Accommodation	Food Services and Drinking Places	Total
2000	Direct	0.00	0.00	0.00	0.06	x	x	x	0.65	0.71
	Total	0.00	0.00	0.00	0.07	0.00	0.11	2.03	0.72	2.92
2001	Direct	0.00	0.00	0.00	0.00	x	x	x	0.00	0.00
	Total	0.00	0.00	0.00	0.00	0.00	0.00	1.10	0.00	1.10
2002	Direct	0.00	0.30	0.03	0.77	x	x	x	0.53	1.64
	Total	0.00	0.34	0.04	0.92	0.34	0.01	0.95	0.58	3.18
2003	Direct	0.00	2.21	0.06	0.71	x	x	x	0.22	3.20
	Total	0.00	2.56	0.07	0.82	1.29	0.00	1.33	0.23	6.31
2004	Direct	0.00	N/A	0.04	0.23	x	x	x	0.47	0.74
	Total	0.00	0.11	0.04	0.26	0.76	0.04	1.08	0.51	2.81
2005	Direct	0.00	1.32	1.19	0.13	x	x	x	1.26	3.90
	Total	0.00	1.52	1.28	0.18	0.00	0.00	2.35	1.37	6.70
2006	Direct	0.00	N/A	0.05	0.04	x	x	x	1.64	1.72
	Total	0.00	0.52	0.05	0.07	0.89	0.02	0.75	1.78	4.08
2007	Direct	0.00	2.18	0.00	0.27	x	x	x	1.77	4.22
	Total	0.00	2.49	0.00	0.32	1.15	0.05	1.06	1.93	7.00
2008	Direct	0.00	1.65	0.00	0.27	x	x	x	2.12	4.04
	Total	0.00	1.89	0.00	0.32	0.84	0.04	1.92	2.32	7.32
2009	Direct	0.00	0.59	0.20	0.29	x	x	x	2.04	3.12
	Total	0.00	0.68	0.21	0.34	6.66	0.06	2.18	2.22	12.35

x - multipliers were not available due to confidentiality reasons